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Groundwater Sampling and Analysis Plan
Feddeler Construction/Demolition Site
Lake County, Indiana

Prepared For:

Bingham Summers Welsh & Spilman
10 W. Market St.
Suite 2700
Indianapolis, Indiana 46204

Submitted To:

Commissioner
Indiana Department of Environmental Management
Office of Solid and Hazardous Waste Management
100 N. Senate Avenue
Indianapolis, Indiana 46206

Weaver
Boos
Consultants, Inc.

ENVIRONMENTAL AND GEOTECHNICAL SERVICES
Chicago, Illinois Griffith, Indiana Albuquerque, New Mexico

GROUNDWATER SAMPLING AND ANALYSIS PLAN
FEDDELER CONSTRUCTION/DEMOLITION SITE

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1.0 INTRODUCTION

The following presents a Sampling and Analysis Plan (SAP) for implementation of groundwater monitoring activities at the Feddeler Construction/Demolition Site, operated by R&M Enterprises, Inc. The Feddeler Construction/Demolition Site is a construction demolition waste landfill, located just west of Lowell, in West Creek Township, Lake County, Indiana (see **Figure 1 - Site Location Map**).

In compliance with Solid Waste Facility Permit FP# 45-08, R & M Enterprises, Inc. operates and maintains a groundwater monitoring system capable of detecting statistically significant changes in groundwater quality occurring downgradient of the facility.

Pursuant to permit condition D10, all groundwater monitoring wells which constitute the facility's permanent groundwater monitoring well system shall have water quality samples taken and tested individually on a semiannual basis during the months of June and December.

2.0 PURPOSE

This Sampling and Analysis Plan (SAP) for the Feddeler Construction/Demolition Site has been developed in accordance with 329 IAC 10-21-2. In addition, permit condition D9 indicates that a SAP shall be submitted for approval, in writing from the OSHWM staff. The purpose of the SAP is to provide a framework for the consistent collection of groundwater samples, which are verifiable and representative of the site's groundwater conditions. Adherence to a standardized protocol for sample collection, management and analysis procedures will allow collected data to be comparable over time.

Specific procedures for groundwater sample collection, water level measurement, sample preservation and handling, chain of custody procedures, and analysis of samples collected at the Feddeler site are described in the following sections. All sampling and analysis of groundwater at the Feddeler site will be performed in strict accordance with the procedures and methods outlined in this plan. All personnel involved in groundwater sampling at the Feddeler site must review and become familiar with the requirements of this SAP. Any deviation from this plan requires prior approval from IDEM. In addition, any revision of this plan will be forwarded to IDEM prior to implementation in the field.

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3.0 SAMPLING DATES

Solid waste facility permit FP# 45-08 regulates the Feddeler Facility. The Feddeler Construction/Demolition Site is currently required, in accordance with the above referenced permit, to perform groundwater sampling on a semi-annual basis. Groundwater sampling events are required to occur in the months of June and December.

4.0 ANALYTICAL PARAMETERS

According to permit condition D10, the detection groundwater monitoring parameters (i.e. Phase I parameters) for the site consist of the following:

- Field pH
- Specific conductance
- Chloride
- Barium
- Arsenic
- Sodium
- Sulfate
- Ammonia
- Methylene chloride
- 1,1-Dichloroethane
- Toluene
- Benzene
- 1,2-Dichloroethlyene (total)
- Ethyl benzene
- 2-Butanone (Methyl ethyl ketone)
- Total phenolics

5.0 GROUNDWATER MONITORING SYSTEM

Table 1 presents specific Feddeler Construction/Demolition Site monitoring well network detail. Groundwater monitoring well locations are illustrated on **Figure 2**.

6.0 PRE-SAMPLING ACTIVITIES

Preparation for a successful sampling event must begin in advance of field sampling operations. In as much as possible, sampling events will be scheduled at least two weeks in advance of the sampling event. This will allow time for the preparation and assembly of sampling equipment, sampling bottles, labels, chain of custody forms, and field data sheets.

It is important to note that, although every effort will be made to adhere to established monitoring schedules, sampling events may be subject to change based on factors such as weather. No sampling will occur at the Feddeler Construction/Demolition Site during inclement weather conditions, including:

- when precipitation in the form of rain or snow will potentially contaminate samples.

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- when winds are strong enough to cause blowing dust and other materials to uncontrollably contaminate samples.
- when the weather is so cold that it interferes with the operation of equipment or the sampling crew's ability to exercise effective quality control.

The decision to postpone or delay a sampling event will be at the discretion of the project manager and will be reported to the IDEM if such a delay extends beyond the calendar month for which the sampling event was originally scheduled.

Prior to each sampling event, analytical results from the previous sampling event will be reviewed. Under the direction of the project manager, a well sampling sequence will be developed for the upcoming sampling event. The upgradient wells and downgradient wells are designated for the purpose of well sampling order. Wells will be sampled in order of increasing potential for impact from the facility (see Section 22.2). The sampling team will determine the sampling order prior to arriving at the facility. The following presents a brief summary of the facility monitoring well network:

Upgradient Wells	Downgradient Wells
MW-1	MW-2
MW-5	MW-3
MW-6	MW-4
MW-8	MW-7
	MW-9
	MW-10
	MW-11

7.0 SAMPLER TRAINING

Field sampling personnel are key to ensuring the overall quality control of the data. All sampling personnel should receive formal training in proper sample collection techniques. Key responsibilities and tasks which must be completed by field personnel include:

- Reviewing the sampling and analysis plan. Field sampling personnel should develop an understanding of sampling locations, methods, sample quantities, and personal protective measures required on-site;

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- Ensuring that a copy of the sampling and analysis plan is available for reference at the monitoring well head each time groundwater samples are collected;
- Ensuring that samples are representative of the conditions and the matrix from which the sample was collected by following the procedures outlined in the sampling and analysis plan;
- Ensuring that only equipment specified in the sampling and analysis plan are used to collect groundwater samples;
- Calibrate field meters at the beginning and the end of the day to verify proper operation. Document the calibration with the field meter identification, date and time of calibration, calibration standards used, calibration results, and the name of the person who performed the calibration in the field log book (calibration procedures are included in **Appendix A**);
- Properly preserving, packaging, and shipping samples to ensure that they arrive at the laboratory unchanged;
- Implementation of chain-of-custody procedures and the proper documentation of field conditions and field measurements such as pH, temperature, and specific conductance.

8.0 ACCESS RESTRICTION AND WELL SECURITY

Access restriction is provided for the site by chain link fencing. No persons will be allowed into the facility without the facility operator's consent, or legal search authority under statute or rule. All wells are provided with a security system, including a damage preventive casing and access restriction.

The primary method of damage prevention is a metal outer casing around the well riser. Additional damage prevention, and increased visibility, is provided for all wells in close proximity to roadways by guard posts surrounding the well. Each well is provided with a lock that will prevent unauthorized access to the well riser. Lock mechanisms are serviced at least twice a year (when the well is sampled) to check operation.

9.0 REVIEW OF SAMPLING AND ANALYSIS PLAN

Prior to the sampling event, field personnel will review the Sampling and Analysis Plan to become familiar with the sampling procedures, objectives, and expected site conditions. Field personnel must also perform any necessary equipment inventories and inspections, and coordinate with the laboratory so that the required sample kits (containers) are available.

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The majority of these tasks may be completed several days prior to sampling, however any equipment that is maintained at the facility will be inspected on the day of sampling.

10.0 SELECTION OF EQUIPMENT

Equipment utilized during a sampling event may vary due to the multiple activities and readings required by IDEM regulations and site specific conditions. Each set of equipment is selected based on consideration of the conditions unique to the Feddeler Construction/Demolition Site. Controlling factors in the selection of equipment include:

1. The parameters possible for detection at the site.
2. The accuracy of the readings produced by the equipment.
3. The ease of operation (including calibrations).
4. Serviceability.
5. Portability.
6. Ruggedness.

11.0 PURGING EQUIPMENT

11.1 Bailer

The primary method for well evacuation will be by dedicated PVC bailer. A bailer is a bottom filling tube designed to penetrate the water column and fill, and reseal by the use of a check valve/stopper device (usually a check ball). The technology of the bailer represents the most basic design, rendering the bailer the most resistant to mechanical failure. Bailers are suited to withdrawal of sample waters with minimum agitation. Withdrawal rate with a bailer is strictly controlled by the sampler. The rate of purging using a bailer is rarely great enough to cause cascading of the formation water into the well. Furthermore, the amount of suspended sediment does not adversely effect the performance of a bailer in removing water from the well.

The bailers utilized at the Feddeler Construction/Demolition Site will be dedicated, meaning they will be used exclusively in a single groundwater monitoring well. The bailers will remain suspended in the monitoring well, above the water column when not in use.

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12.0 FIELD METERS FOR pH AND SPECIFIC CONDUCTANCE

All field equipment used during sampling events will be calibrated before each sampling day according to the manufacturer's specifications. The source and type of calibration standard used will be stated on the field record, and the solution retained for use at the end of the sampling day. Field meter calibration standards will be dictated by the historical data from the site. Standards will be more acid than the most acid wells average reading, and a second standard will be more base than the most alkaline wells average reading. A copy of the owner/operators manual for each field instrument anticipated to be utilized for sampling activities at the Feddeler Construction/Demolition Site has been provided as **Appendix A**.

13.0 TEMPERATURE AND PHYSICAL APPEARANCE

Equipment will be utilized to record the in-situ temperature of the groundwater in degrees Celsius on the field record. This reading is to allow correction of calculations involving groundwater if the calculations are temperature sensitive. Physical appearance of the groundwater, measured by visual observation of the sampling team, will be recorded in the field record (see **Appendix D** for an example of the groundwater sampling field form).

14.0 FIELD PERSONNEL SAFETY EQUIPMENT

Field sampling personnel will don protective clothing appropriate to any suspected hazardous conditions that may be encountered based on previous results of samples collected at the site. Applicable regulatory provisions of the Occupational Safety and Health Administration (OSHA) will be adhered to by field personnel. Latex or vinyl gloves will be worn by the sampling crew anytime personal contact is possible with sample water, open sample containers, sampling equipment (previous to, during or after introduction of the equipment into the well), or the open well.

15.0 EXTERNAL CONTAMINATION PREVENTION EQUIPMENT

Under no circumstance will any equipment to be introduced into the well be allowed to come into contact with the ground. This is to prevent introduction of potentially contaminated soils into the well. A plastic sheet will be placed in the area around the well protective casing to prevent contact between equipment and the soil. Additional protection from cross-contamination concerns may be provided for bailer cord by supplying a plastic lined container to temporarily hold excess cord as it is withdrawn. All equipment to be utilized for samples from more than one sampling point will be decontaminated. Decontamination procedures for non-dedicated equipment is described below in Section 18.0.

16.0 CORD/ROPE

Bailers require the use of cord to lower the equipment into the water column. In the event bailers are used for the sampling event, the cord's chemical composition must be recorded on the field record. If necessary, dedicated 3/8" polypropylene rope with 3' long x 3/32" diameter Teflon coated stainless steel wire leader will be used in conducting purging and sampling activities at the Feddeler Construction/Demolition Site. When not in use, dedicated rope will be stored in a labeled, sealable plastic bag. Reuse of flexible rope of any composition in multiple wells is forbidden. The length of cord in contact with the water at anytime should be minimized.

17.0 FIELD FILTRATION

The sampling crew will filter dissolved metal analysis samples in the field. In-line high capacity disposable filter cartridges with a maximum pore size of 0.45 microns will be utilized. The QuickfilterTM model # FF8200 in-line disposable filter, manufactured by QED Groundwater Specialists, located in Ann Arbor, Michigan will be used to field filter all dissolved metals samples. Alternative filters may be used if equivalent to the above.

18.0 DECONTAMINATION OF NON-DEDICATED EQUIPMENT

Decontamination of non-dedicated equipment applies to any equipment employed in acquisition of independent grab samples from more than a single well. Techniques for decontamination are specific to the equipment being cleaned. All equipment that has been decontaminated for reuse will be rinsed by water withdrawn from the sampling source (where possible) prior to introduction to the sample.

18.1 Bailers

In the event that non-dedicated bailers are used to sample any of the existing facility wells, they will be decontaminated after each use. This will be accomplished by washing the entire assembly (valve and tube) in a non -phosphate detergent and potable water bath, utilizing a bailer brush of the appropriate size for abrading the interior of the bailer. The bailer and valve will then undergo a gross rinse in potable water. The bailer will then be double rinsed in deionized or higher grade water. When not in use, the bailer will be stored in a predesignated container.

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18.2 Field Reading Meters

Meters for specific conductance, temperature, and pH will be washed with a non-phosphate detergent solution and rinsed with a volume of deionized water equal to a minimum of four times the volume used by the meter for effective reading.

18.3 Teflon Coated Wire

The entire length of wire will be submersed in a non-phosphate detergent bath. The full length must be abraded by a clean cloth as it is removed from the wash bath, and deposited into a gross rinse bath, composed of potable water. The cord will then be lifted as a coil and placed in a final deionized water rinse.

18.4 Field Filtration Systems

Reuse of filter membranes for more than one sample is prohibited. Equipment for conveying the sample through the membrane can be used for multiple samples, provided that it is properly decontaminated between samples. The first concern is the decontamination of the intermediate container between extraction from the well, and contact with the dedicated filter membrane. The containment reservoir and all parts contacted by the sample water will be washed by a non-phosphate detergent bath, abraded with a clean brush or cloth in the bath, gross rinsed in at least potable water, and finally rinsed in deionized water. Prior to filtration of the next sample, the reservoir will be rinsed by the water of the next well to be sampled before filling the reservoir to filter the next sample set. Refer to Section 24.0 for additional information regarding decontamination procedures for the field filtration system.

18.5 Water Level Indicators

Water level indicators will be decontaminated before being introduced into any well. The head of the indicator will be cleaned in a non-phosphate detergent wash after each well. The probe will be abraded with a bristled brush in the detergent in order to remove any contaminants. The probe will then be double rinsed in deionized water. The measuring tape for the water level probe will be decontaminated in the same manner as Teflon coated wire in this section. The tape will be decontaminated at a length equal to the total depth of the well plus the well riser height, plus three (3) feet. Non-Phosphate detergent baths utilized in the decontamination of field equipment will be mixed following the manufacturers label instructions. The amounts of detergent and water used

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in the mixture will be recorded on the facility field sheet, along with the brand name of the detergent used.

19.0 PIEZOMETRIC/POTENTIOMETRIC SURFACE READINGS

During each sampling event, the sampling team will obtain a static water level reading at each well or piezometer listed in **Table 1**. Prior to the removal of any water from a monitoring device, the water level will be acquired by measuring the water level in relation to the survey mark on the well riser. The method to be used requires that static water level in a well be measured just prior to purging. Water level measuring devices will be accurate to 0.01 feet.

20.0 TOTAL WELL DEPTH

Total well depth will be measured at the same time as the static water level to assess the effectiveness and state of repair of the well. If the total depth of the well is significantly different from the well depth recorded on the well driller's record, the sampling team will note these findings on the field record. Upon evaluation,. required repairs will be made to affected monitoring wells, or a demonstration will be made that the well's performance is unaffected by the well depth change, and that the same hydrostratigraphic unit is being monitored by the existing screened interval of the well.

21.0 WELL EVACUATION

21.1 Methods of Evacuation

To ensure the collection of a representative sample of water in the formation, the static water in the well casing must be removed. The method of evacuation will be suited to the recharge rate of the specific well, the well depth, and the diameter. Suitable equipment will in all cases, fit within the well riser without inflicting damage, be easily retrieved up the riser, and remove volumes of water in a time efficient manner. The primary method for well evacuation and sampling will be by dedicated PVC bailer.

21.2 Evacuation: Rate and Volume

The withdrawal rate will not create a great inward gradient, or cause the water to enter the well at a highly accelerated rate. Complete removal of stagnant water (purging dry) is the only certain

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way to assure the evacuation of all stagnant water in the well casing. In some cases, recharge rate is too great to allow purging a well dry.

The volume of water to be removed, by bailing, for effective purging is a minimum of three (3) well volumes for wells with recovery rates great enough to recharge the well casing during the purging process. Exceeding five (5) well volumes during purging is prohibited since the object is to sample formation water in the vicinity of the well. Purging large volumes of water does not accomplish removal of stagnant waters, but can potentially draw water from greater distances to the well. The water drawn to the well could potentially dilute any contaminants in the vicinity of the monitoring well.

Purging of wells for removal of stagnant waters will be accomplished by placing the bailer within the screened interval of the well. To assure that purging has been effective in drawing fresh formation water into the well, purging must be continued past the 3 well volume minimum until the field parameters of pH, Eh, Specific Conductance, and Temperature have stabilized within ±10% of a field determined mean reading, or until 5 well volumes of water have been purged, whichever occurs first.

A minimum of three samples must be collected and field analyzed to arrive at the "field determined mean reading". Samples will be collected for field analysis each time approximately one half the volume of water originally in the casing is removed during the purging process. Field analysis results for each of the next three samples (samples 4, 5, and 6) must agree within 10 percent of the mean of samples 1, 2, and 3. In the event that the field analysis results for samples 4, 5, and 6 do not agree with the mean, another sample will be collected and analyzed (sample 7). The values obtained from sample 1 will be discarded, and a new mean will be calculated using values from samples 2, 3, and 4. The values from samples 5, 6, and 7 will be compared to the new mean. Stability will not have been reached until the most recent three consecutive samples agree within 10 percent of the mean value determined from the three samples collected immediately prior to the most recent samples.

Note that if the field parameters have stabilized after three well volumes, then sampling will commence after three well volumes have been removed. However, if stability has not occurred, then purging will continue to either stability, or until a total of five well volumes have been removed, whichever occurs first.

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Note that purging to stability is optional, but acceptable, as long as a minimum of three well volumes, but no more than five well volumes of water are removed from the well prior to sampling.

22.0 SAMPLE COLLECTION TECHNIQUE

Samples will be collected in such a manner as to minimize the likelihood of volatilization or external contamination. The exact collection method depends on the equipment to be utilized during sampling.

22.1 Bailers

Sampling from a bailer will be conducted in a manner which minimizes the contact of the water with potential external sources of contamination. Protective hand gear (latex gloves) will be used to prevent direct contact of the sampler's hands and the bailer. The bailer will be lowered in a slow and steady manner until the top of the groundwater is contacted. The bailer will then be lowered carefully into the water column until the bailer is full, or the base of the well is contacted by the bottom of the bailer. Once filled, the bailer will be lowered no further into the water column. Care should be taken not to contact line lengths of the bailer cord into the water column. Contact minimization between cord and sample water reduces potential contamination introduced from the cord, and assures the uppermost zone is being monitored. The bailer will then be withdrawn at a slow steady rate up the well casing. When the bailer reaches the top of the well riser, it will be removed carefully to prevent aeration or agitation. The bailer cord should be pulled away from the water flowing from the top of a top discharging bailer. Where organic constituents are suspected, bottom discharging bailers can be utilized for appropriate samples in the set.

22.2 Order of Sample Collection

Wells will be sampled in order of increasing potential for impact from the facility. All upgradient wells will be sampled before any downgradient wells are sampled. The order in which downgradient wells are sampled will be determined using previously acquired sample data to assess potential impacts. Impacted wells will be sampled in order of increasing degree of affectedness. If no well is confirmed or suspected of being impacted, the most distant downgradient wells from the nearest waste will be sampled first. Wells will be sampled in order of decreasing distance from in place waste. Where wells are approximately equal in distance from

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waste, wells closer to the most recently placed waste will be sampled before wells close to waste in place for longer periods of time. The sampling team will determine the sampling order prior to arriving at the facility. The well sampling order will accompany the analytical results.

The order of sample collection will be established to account for the parameters to be analyzed. The normal order of sample collection will reflect volatility of the compounds to be analyzed and enforcement potential of the parameter (established MCL under the Clean Water Acts). Under adequate water supply conditions, the normal collection order for wells in routine Phase I monitoring will be:

1. VOC's,
2. field parameters (pH and specific conductance),
3. dissolved metals,
4. parameters extracted from unpreserved sample.

22.2.1 Low Water Sampling Contingency

In the event of dramatic seasonal fluctuations in the water table, the Feddeler Construction/Demolition Site has developed a contingency sampling order for a low water supply. Based on previous analytical data, the following sampling order for a low water supply has been established.

1. dissolved metals,
2. field parameters (pH and specific conductance),
3. VOC's,
4. parameters extracted from unpreserved sample.

23.0 CONTAINERS, CONTAINERIZING OF SAMPLES, AND MINIMUM SAMPLE VOLUME

Varying parameter and method types dictate specific chemical materials for sample containers to minimize contamination by the container. Sample containers will be new, and accompanied by the manufacturer's certificate of analysis for the container lot number. Provided as **Table 2** are the requirements for preservatives, bottle material composition, and refrigeration. Samples collected for volatile organic constituents will have zero head space. Samples will be poured into the container so that water entering the bottle contacts the wall of the bottle and runs down the wall

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to the sample already containerized. The side wall method should be used continuously for 40 ml vials. Liter bottles should be sidewall filled where the neck of the bottle allows tipping of the container.

To ensure a successful sampling event, double the minimum volume required for analysis should be collected at each well (to allow for laboratory error), when well water production permits. Sampling equipment contact with containers will be minimized to prevent cross contamination. Containers will be kept in a secure area (away from possible sources of contamination) prior to use. Chemicals used as preservatives will be referred to by source and concentration. The source laboratory or manufacturer of the chemicals used as preservatives will provide, upon request, an analysis of the trace elements present in the preservatives, the concentration of these impurities, and the methods used in the preparation of the chemicals. The required information on preservation source and batch number will appear on the field documentation for each sample set collected. Waters used must be of deionized grade or better. Any water used for decontamination purposes will be collected in an equipment blank and analyzed (see Section 25.2).

24.0 PRESERVATIVE AND FILTRATION METHODS

Chemical preservatives will be added to sample bottles prior to filling of the bottle. Physical preservation of the sample set will include prevention of exposure to direct radiation (solar or other) and expedient refrigeration of the sample to a temperature of near 4°C. The refrigeration temperature will be confirmed by the use of a thermometer in each cooler containing samples. The temperature in the cooler upon arrival at the analytical laboratory should be recorded on the field record and on the chain of custody.

Dissolved metals samples filtered by non in-line equipment will be initially collected in a non-preserved container (bottle, reservoir or other decontaminated container) prior to filtering. A MasterFlex portable peristaltic pump will be used to filter groundwater samples for dissolved metals analysis. The owner / operators manual for this pump is included in **Appendix A**. Tubing for the peristaltic pump must be 1/4" I.D. thick-wall silicone.

The dissolved metals sample will be propelled through the peristaltic pump and will be placed into the preserved sample bottle as the sample exits the filter membrane.

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The peristaltic pump tubing will be decontaminated after use at each well according to the following procedures:

- After each water sample passes through the pump and tubing, a volume of distilled or deionized water and nonphosphate detergent solution equal to the sample volume must be immediately passed through the pump and tubing.
- The detergent solution must be followed by a potable water rinse. The volume of the rinse must be three (3) times the detergent solution volume.

25.0 QUALITY CONTROL BLANKS

The following quality control blanks will be obtained during each routine semi-annual groundwater monitoring event at the Feddeler Site:

25.1 Trip Blanks

Trip blanks will be taken by the sampler prior to the collection of any monitoring well sample. The trip blank will be deemed a sample and will accompany the other samples from the site at all times. This ensures that the trip blank is exposed to all conditions to which the samples are exposed. The facility may collect and analyze as many trip blanks as desired, but a minimum of one trip blank is required for each sampling event. If the trip blank is containerized prior to entry onto the site, the blank is not deemed to be a sample until such time as the trip blank sample physically enters the facility monitoring/compliance boundary. The trip blank will be analyzed for the Phase I parameters listed in Section 4.0, unless the facility is in assessment monitoring.

25.2 Equipment Blanks

At least one equipment blank will be collected from each piece of non-dedicated equipment used to collect samples at the site. This includes non-dedicated pumps, intermediate containers, and reusable sections of the filtration equipment. Analysis of the equipment blank may be limited to constituents of concern that would be reasonably suspected of contaminating the groundwater samples, as a result of the equipment. This blank can also be used as a check on sample collection and decontamination procedures. The equipment blank will be analyzed for the Phase I parameters listed in Section 4.0, unless the facility is in assessment monitoring.

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25.3 Field Blanks

At the end of each sampling day the field sampler will collect one field blank sample. Field blanks will be a complete set of samples, consisting of deionized or distilled water, containerized at the head of any monitoring well during the sampling event. The sampling crew (at their option) may collect multiple field blanks during a single sampling event, if the samplers feel that conditions at the well riser may contaminate the sample from a source other than the groundwater. A field blank's main purpose is to ascertain the effects of any ambient site conditions (exhaust, dust, cross-contamination) on the collected samples. The field blank will be analyzed for the Phase I parameters listed in Section 4.0, unless the facility is in assessment monitoring.

The water used for the field blank sample must be distilled water or deionized water brought onto the site and poured into the designated sample bottles within fifty (50) feet from any groundwater monitoring well sampled the day the field blank is collected.

26.0 QUALITY CONTROL SAMPLES

26.1 Duplicate Samples

Duplicate samples should be collected in a concurrent manner. Duplicate samples are collected by filling all bottles for each analysis, then proceed to the next constituent group. Each sample set will be numbered and labeled in a unique manner. The well where the duplicate was obtained will be recorded. The well will be purged in the approved manner and to the required volume. Sample collection will occur in the following approved order:

1. All VOC containers from all sample sets will be filled (if VOC are being sampled).
2. Field parameters (pH and specific conductance, etc.) will be repeated twice until all parameters are sampled for analysis.
3. All remaining sample bottles will be filled.

Sufficient volume of water must be present in the well to collect the duplicate sample in a single purge and sample event of the well for all required parameters. The duplicate sample will be analyzed for the Phase I parameters listed in Section 4.0, unless the facility is in assessment monitoring.

Procedurally, duplicate samples are not independent of each other. All samples are split from the same aliquot of water for individual analysis.

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For each groundwater sampling event, a duplicate sample will be collected if more than one well is purged and sampled. Duplicate samples will be collected at a frequency of one duplicate per groundwater sampling event.

27.0 ANALYTICAL METHODS

To assure the validity of data acquired from groundwater samples, the Feddeler Construction/Demolition Site has included as **Appendix B** a Quality Assurance Project Plan (QAPjP) for the facility's contracted analytical laboratory, SIMA LABS International Laboratories, Inc. located in Merrillville, Indiana.

28.0 CHAIN OF CUSTODY PROCEDURES

The Feddeler Construction/Demolition Site will, when conducting sampling events, utilize a chain of custody protocol. The purpose of chain of custody is to legally account for the possession and security of the samples from the time the samples are extracted, until the printing of the analytical results.

The chain of custody is to be divided into two parts (see **Appendix C**). The field chain of custody will account for the sample(s) from the time the sample is removed from the well and placed into the appropriate container, until the sample custodian of the analytical laboratory signs the field chain of custody, taking possession of the sample. The laboratory chain of custody will account for the location and security of the sample from the sample's arrival at the analytical laboratory until analysis of the sample is found to be acceptable under the facility QAPP.

The chain of custody is a legal documentation of persons having contact with the sample from the time of collection, until conclusion of analysis. Anyone signing the chain of custody may be called as a witness in legal actions to testify to the whereabouts and security of the sample(s) while in the possession of the signatory. Each sample set will be recorded by a unique identifier on the chain of custody record, including:

- number of containers in the sample set
- all persons in contact with the sample(s), (sampler/sampler(s), transport personnel, analysts)
- times and dates of surrender of sample(s) to another party
- the analysis to be performed on the sample(s).

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The field chain of custody will be submitted as part of the analytical results for the monitoring program. The laboratory will maintain the laboratory chain of custody to be released to the Indiana Department of Environmental Management upon request.

29.0 DEFINITIONS SECTION

Access Restriction - A physical and psychological barrier which limits the free entry of a person into an area or object. This can include but is not limited to signs, fences, locks and security patrols/stations.

Complete Data Packages - Will include at a minimum: Field documents, calibration logs for all field meters, analytical results for samples collected, initial calibration curves for wet chemistry analyses, metals, and organics, chain of custody records (copies will suffice), documentation as required in the QAPP, and all information required in the operating or closure permit.

Composite Sample - Samples representing a series of sampling points or chemical compositions. Composite sampling is not allowable for groundwater monitoring for the purposes of detection or assessment monitoring. Corrective action plans may include composite sampling as a part of proposed mixing model or remediation plan.

Dedicated Equipment - Sampling or bailing apparatus which is used exclusively for use in a single groundwater monitoring well. This can include parts of an apparatus which is the only part which will come in contact with the material to be analyzed. Filter membranes, bailers, rotary pump systems and sample containers are examples of dedicated equipment.

Dry Well - Any groundwater monitoring device which is unable to:

1. Deliver water to be purged from the well casing when opened for sampling, but is mechanically undamaged.
2. Does not have a recovery rate great enough to supply groundwater for sampling utilizing the facilities low water order as defined in the SAP plan within a 24 hour period after the well is purged.

Wells which are dry on a consistent basis will be deemed malfunctioning under the well maintenance section and must be replaced or delisted to piezometers and relocated. Solid waste facilities geology section may grant variance to this definition, case by case.

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Duplicate Sample - A sample collected to provide evidence that the conditions are repeatable but does not assume that conditions at the well do not change over short periods of time. Procedurally, duplicate samples are not independent of each other. Duplicates are collected by filling all bottles of each analysis, then proceed to the next analyte. All samples are split from the same aliquot of water for individual analysis.

Evacuation - Removal of water from a well or piezometer for the reason of preparing the well for sample collection, by purging stagnant water from the screened interval, or the act of collecting a representative groundwater sample, duplicate, or field confirmation sample from a groundwater monitoring well.

Field Documentation - Records of the physical conditions of the collected samples. These readings include water temperature, water color, specific conductance of sample, solution pH, time of collection, on site weather conditions and other parameters as required in the site SAP. The samplers opinion or perceptions are to be recorded here. Conditions as ambient odors/vapors, reactions with preservatives, difficulty capping without head space, et al are vitally important and should be reported on the field record. All observations recorded in the field document will be legally binding and admissible as evidence (written observations of an eye witness) in a court of law. Field documents will be signed by all field staff present at the time of the sample collection/observation (also equivalent to field log, field book, field record and field sheet et al).

Field Sampling Event - That period of time commencing with initial entry of the sampling team, until such a time as the entire sampling of all scheduled devices locations/measurements are complete or deemed as inaccessible. This time will include all related activities (calibrations etc.) whether accomplished on or off site. The field sampling event will be deemed as ended when transport of the samples are complete and the chain of custody proceedings are signed by the sample officer at the analytical laboratory.

Gas Lift Pumps and Gas Drive Pumps - Pumps of these descriptions are not acceptable for use in sampling of monitoring wells in the state of Indiana.

Grab Sample - A sample acquired "mid flow" or in a manner to collect the media to show a single point in space and time set of conditions.

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Independent Sample - A sample or sample set collected in a manner which provides a unique measure of the chemical and physical properties of the water passing within the area affected by the well screen's interval over the period of time elapsed during sample collection.

Indicator Media - Such substances that can indicate the types or specific chemical constituents or physical conditions (i.e. temperature) likely to be produced or actually produced by influence of a solid waste disposal facility. These media can be liquid/aqueous, or solid. The most outstanding examples are water (both surface and ground) monitoring, waste stream testing and soil monitoring.

Metal Protective Casing - Any malleable substance meeting the description of Metal or Semi-metal under ASTM standards (most notably Aluminum or Steel of any alloy) which is formed into a shape to completely surround the well riser. The metal casing will be configured to accommodate the application of a locking mechanism to the casing. When open, the protective casing will provide clear access to the well riser, well cap and any well purging equipment in the well. The metal protective casing will be secured to the ground by either attachment to the grout materials (existing wells) or bolting the casing into the concrete pad provided the well (new wells).

pH - (-log [H]), Dissolved hydrogen ion activity concentration.

Recharge Rate - The time per unit volume required for a groundwater monitoring well to draw water from the formation around the screened interval of the well (this rate may equal or exceed the withdraw rate). In such a case, a well is instantaneously recharging. In cases where withdrawal of volume per unit time exceeds the transmissivity of the aquifer a cone of depression is formed. This cone's shape is a direct result of the recharge rate of the well and the transmissivity of the aquifer.

Representative Sample - Sample which accurately portrays the conditions present at a location. The location could be on any scale, at any time or could be very specific and local. The result of analysis should be reproducible by duplicate sample with only minor variation. Representative samples are not average or composite values unless specified as such.

Rotary Pump(s) - Any pump which utilizes an impeller, piston or other mechanical parts in the path of water flow. The main physical force used to propel the water is pressure

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gradient/vacuum. The action of the moving parts can tend to agitate water passing through the pump. This includes Helical Rotor Pumps, Piston Type Pumps, Gear Drive Pumps and Centrifugal Pumps.

Sample - A set of containers which has been prepared to transport a volume of indicator media to an analytical laboratory for analysis in a manner consistent with the facilities Quality Assurance Project Plan. The sample will include as many individual containers as are necessary to comply with the required sampling event requirements. The containers will be prepared in a manner consistent with the facilities QAPP in regards to preservatives, composition, physical conditions, et cetera. Each sampling point will produce one independent sample, and possibly replicates, duplicates or field confirmation samples, each sample may consist of multiple containers acquired from a single sample aliquot.

Sample Container - Any vessel used to contain a sample during the time between collection and analysis.

Sample Set - Will compose of one or more samples from a single facility. Each sample will represent a single sampling point.

Sampler(s) - Same as sampling crew.

Sampling Crew - The person or persons charged with the responsibility to properly acquire representative groundwater samples from the facility's groundwater monitoring system.

Sampling Day - Period of time in a calendar day during which the sampler is involved with activities concerning the sampling at the facility. This includes any activity with the sampling equipment after the first sample has been acquired on behalf of the facility for the purpose of monitoring the groundwater.

Sampling Event - Refers to all activities relating to the legal acquisition of samples of groundwater for the purpose of groundwater monitoring as prescribed in 329 IAC 10-21-2. Included in addition to active acquisition of the groundwater samples are all blanks and duplicates, field documentation, transport, custody record, and analytical records and results. The sampling event officially ends when the results of the analysis are received by the Office of Solid and Hazardous Waste.

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Specific Conductance - The ability of water to conduct electrical current. This is expressed in terms of microohms/cm this measurement gives a gross dissolved ion reading relative to the charge and concentration.

Well Cap - A fitted covering for the well riser. The cap will be in place whenever the well is not in use. The cap may be of any material compatible with the well riser material. The cap will be vented on either top or side to allow air circulation into and out of the well riser. The cap and vent will be designed to discourage the flow of rain and surface waters down the well riser from the top. Well caps must be removable by hand.

Well Development - One of several methods intended to remove the free sediment from the bottom of groundwater monitoring well. These methods include bailing until the water clears, or pumping the well with a sediment tolerant pump until the water clears, or surge development by forcing a volume of water or air into the well at pressure to push fine sediment away from the well filter, or a combination of surge and withdrawal until water does not show suspended sediment. These procedures should be employed whenever a well shows an accumulation of sediment (silt) in the well. The accumulation, is best evidenced by a change in the overall well depth without a corresponding change in the height of the well riser. Care will be executed in which development scheme is used to prevent introduction of chemicals into the groundwater. See well development requirements under 329 IAC 10-21-4 and guidance on monitoring well construction-damage and maintenance.

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Tables

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Table 1
Summary of Monitoring Well Network
Feddeler Construction/Demolition Site
Lake County, Indiana

Well ID	Total Well Depth (feet)	Screen Length	Top of Casing Elev (ft-MSL)
MW-1*	35.1	5	702.80
MW-2	30.7	5	675.30
MW-3	31.5	3	688.65
MW-4	28.0	3	702.71
MW-5*	35.8	3	706.96
MW-6*	33.9	5	695.97
MW-7	36.0	5	673.55
MW-8*	67.0	5	703.44
MW-9	56.0	5	674.59
MW-10	43.8	5	673.93
MW-11	23.3	5	682.40

*indicates upgradient well

Table 2
Sampling Containers and Preservatives
Feddeler Construction/Demolition Site
Lake County, Indiana

Parameter	Container Material (size)	Preservative Recommended	Holding Times
pH	Field Measurement	none	Field Measurement
Specific Conductance	Field Measurement	none	Field Measurement
Chloride	P, G (1000 mL)	Cool to 4° C	28 days
Sulfate	P, G (1000 mL)	Cool to 4° C	28 days
Ammonia	P, G (500 mL)	H_2SO_4 to pH < 2	28 days
Total Phenolics	G (1000 mL Amber)	H_2SO_4 to pH < 2	28 days
Dissolved Metals Analysis:	T,P (500 mL)	Immediately Field filter with 0.45 micron filter membrane, then acidify to pH <2 with $HN0_3$ cool to 4° C	
Sodium			6 months
Arsenic			6 months
Barium			6 months
VOC's	Glass (40 mL VOA Vial)	No head space in vial Teflon Coated Septum in lid (HCl pH <2)	14 days

P-Plastic (polyethylene)
G-Glass (usually amber)

T- Fluorocarbon resins (PTFE, Teflon, FEP, et al)

Figures

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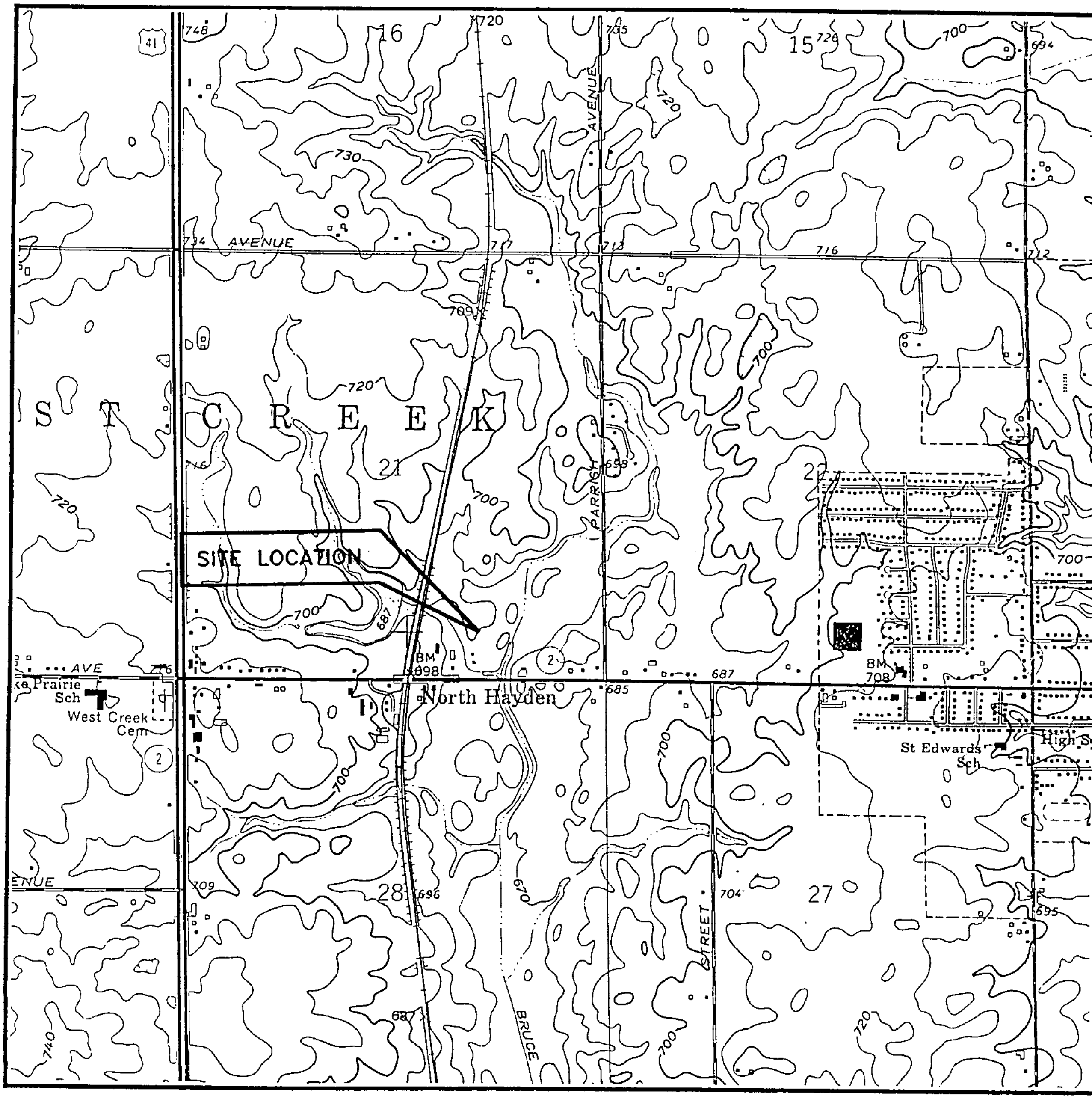

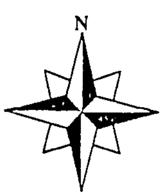

ADAPTED FROM THE LOWELL, INDIANA, USGS 7.5 MINUTE SERIES QUADRANGLE, DATED 1980

COUNTOUR INTERVAL - 10 ft
SCALE - 1:24,000

SITE LOCATION MAP Feddeler Construction/Demolition Site Lowell, Indiana		
WEAVER BOOS CONSULTANTS, INC.		
CHICAGO, IL (312) 922-1030	GRIFFITH, IN (219) 923-9609	ALBUQUERQUE, MN (505) 867-6990
PREPARED BY: MBM	DATE: 10/20/97	FILE: 97-9100
REVIEWED BY: LE	Fig1.doc	FIGURE 1

Owners/Operators Manuals for Sampling Equipment

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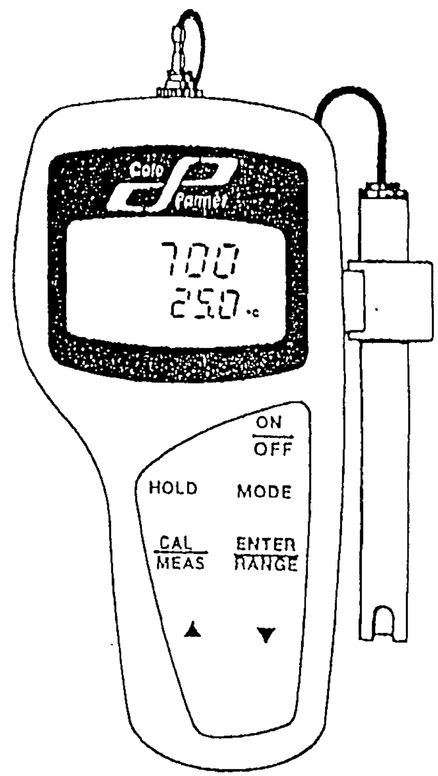
Operating Instructions

Cole-Parmer® 19815-00

Basic Conductivity Meter



Cole Parmer®

Printed in the U.S.A. 1194-R1

Cole-Parmer Instrument Company
625 E. Bunker Court, Vernon Hills, Illinois 60061-1844
1-847-549-7600 or Toll-free 1-800-323-4340
Fax: 1-847-549-7676 Telex: 28-9405

1. Introduction

Thank you for selecting the Cole-Parmer® 19815-00 conductivity meter. Included with your meter is an epoxy platinum probe with built-in temperature sensor and cable, a built-in four position probe attachment and a built-in meter stand.

2. Keypad Functions

See Figure 1, right.

The keypad is easy to use. The LCD has a primary and secondary display. The primary display shows the measured conductivity reading in µS. The secondary display shows the temperature of the reading in °C. Both displays show error messages, keypad and program functions.

Figure 1

Keypad functions

ON/OFF Powers and shuts off the meter. Meter goes into measurement mode when turned on.

HOLD Freezes the measured readings. To activate, press HOLD while in the conductivity measurement mode. To release, press HOLD again.

MODE Select one of two measurement modes: COND (conductivity), or TEMP (temperature).

CAL/MEAS Enters the Calibration function.

ENTER/RANGE Confirms your values. Switches to manual ranging and can scroll to your selected measurement range for conductivity only.

▲ or ▼ Scrolls up or down to the values you want.

3. Preparation

Inserting the batteries (included)

1. Use a Phillips screwdriver to remove the two screws holding the battery cover. See Figure 2, right.

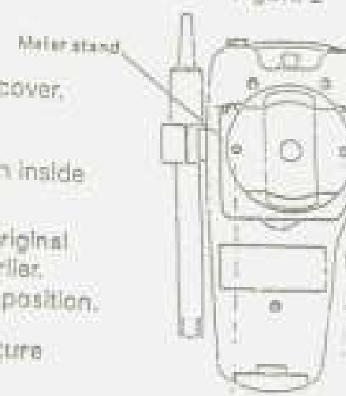
2. Lift meter stand to expose battery cover.

3. Remove battery cover.

4. Insert batteries. Follow the diagram inside the cover for correct polarity.

5. Replace the battery cover into its original position using the screws removed earlier. Replace the meter stand in the folded position.

Figure 2



Connecting the Probe and Temperature Sensor

Note: Keep connector dry and clean. Do not touch connector with soiled hands.

1. Slide the probe connector over the BNC connector on the meter. Make sure the connector slot aligns with the posts of the socket. See Figure 3, right.

2. Rotate the connector clockwise until it locks. Do not force.

Figure 3

Temperature sensor. The temperature sensor uses a phono jack to connect with the socket on the meter. Insert the jack into socket as shown in Figure 4, right.

Figure 4

Inserting conductivity/temperature probe into the electrode holder

The meter includes two probe holders. Do not use excessive force when inserting probes into the holders.

1. Align the end of the probe (sensor side) with the hole

2. [redacted] th[redacted]e in[redacted] ho[redacted]e h[redacted] unti[redacted] top housing of the probe touches the top of the holder.

Figure 5

Attaching the electrode holder to the meter

1. Place the probe holder with the flange facing the slot on the meter. See Figure 5, right.

2. Gently slide the holder flange in the slot. Make sure holder is fixed properly into slot. You can attach the probe holder in different positions, as shown in Figure 6, right. This flexibility helps one-hand operation.

Figure 6

Connecting the optional AC adapter

1. Insert the AC jack as shown in Figure 7, below. This helps conserve batteries but is not required for operation.

2. **Switch off the meter before plugging the adapter into the power source.** This safety precaution protects the memory in your meter.

3. Press the ON/OFF button to switch the power ON.

Figure 7

4. Calibration

Select a conductivity standard near the sample value you are measuring.

The next best method is to choose a calibration solution value that is approximately 2/3 the full scale (F.S.) value of the measurement range. For example in the 0 to 1999 µS range, use a 1413 µS solution for calibration. See "Specifications", page 10.

Preparing the Meter for Calibration

1. Press the ON/OFF key

All the LCD segments display for a few seconds. The LCD switches to the conductivity measurement mode.

2. Press the MODE key to select your mode. Select one of the two calibration modes: COND (conductivity) or TEMP (temperature).

You only need one calibration for measurement of the entire range of the

[redacted]est [redacted] cal[redacted]d ar[redacted]es th[redacted]bra[redacted]formation. However, only the ranges that have been calibrated have maximum accuracy.

If you are measuring in ranges greater than 20 mS or conductivity lower than 100 µS, calibrate the meter at least once a week to get specified ±1% F.S. accuracy. If you are measuring in the mid ranges, and you washed the probe in deionized water and stored it dry, calibrate the meter once a month. Wet the probe for 10 minutes before calibrating or taking readings to saturate the probe surface and minimize drift. If you make measurements at extreme temperatures, calibrate at least once a week.

Use only the conductivity probe specified for these meters. If you do not, you must measure the solution temperature separately and manually enter the solution temperature.

Calibrating for Conductivity

Figure 8

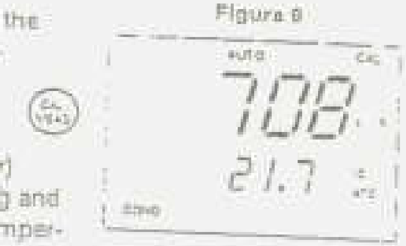
1. Pour out 2 separate portions of your calibration standard and one of deionized water into separate clean containers.

2. Press MODE and select COND. See Figure 8, right.

3. Rinse your electrode with deionized water then rinse in one of the portions of calibration standard.

4. Immerse the electrode into the other standard solution, and press CAL.

Figure 9



NOTE: Allow at least 5 minutes for the probes to equilibrate at the solution temperature. The display shows the CAL mode. "CAL" blinks on the display as long as the calibration mode is on. The primary (larger) display shows the measured reading and the secondary display shows the temperature. See Figure 9, right.

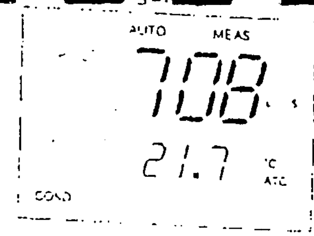
5. Enter value of your conductivity standard. The meter automatically compensates for temperature differences. Use the ▲ or ▼ to scroll to your chosen standard value.

6. Confirm calibration by pressing ENTER/RANGE button.

Upon confirmation, the CAL indicator stops flashing and remains on the screen for 3 seconds. The meter switches back into the measurement mode and the calibrated and temperature compensated value will be

NC[redacted]o e[redacted]m th[redacted]cess without confirming the calibration, press "CAL/MEAS".

Figu[redacted]



See Figure 10, right.

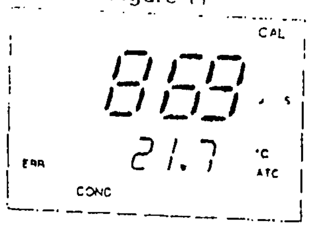
7. For calibration in other ranges (maximum: 5 ranges) repeat steps (1 through 5). But this time, use a solution with a conductivity in the different ranges.

Calibration Error

See Figure 11, right.

For conductivity calibration, "ERR" on the display shows whenever the calibration value input into the meter is different from the initial value displayed by more than 20%. "ERR" displayed warns you of improper probe use, or bad calibration technique.

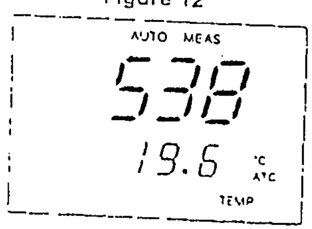
Figure 11



5. Temperature Calibration

The built-in temperature sensor included in the probe is factory calibrated. Calibrate your sensor if you suspect temperature errors that may occur over a long period of time. If you got a replacement probe, see the calibration instructions, "Two Point Temperature Calibration" included with it. Use a known standard solution with your probe. Compare the value to that known standard or from the value of an NIST thermometer.

Figure 12

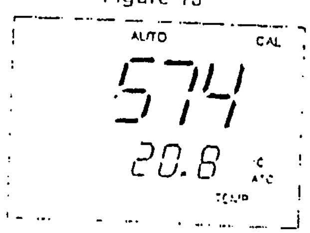


1. Press MODE and select temperature mode (TEMP). Make sure you are in MEAS before you begin software calibration. See Figure 12, right.

2. Press CAL.

Pressing CAL brings you into the calibration mode. The primary display shows the measured Conductivity value, and the secondary display shows the temperature at factory calibration value. See Figure 13, right.

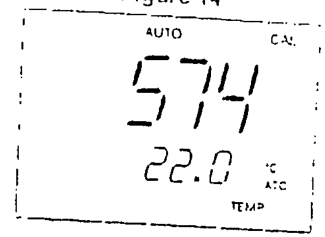
Figure 13



[redacted]ress[redacted] ▼ t[redacted]ust the reading to agree with your temperature standard.

NOTE: Temperature calibration with the probe is restricted to +/- 5°C from the initial value displayed during calibration. However, without the probe, you can set any temperature between 0.0 to 80.0°C for manual temperature compensation. Manual temperature value is stored in memory and can be recalled.

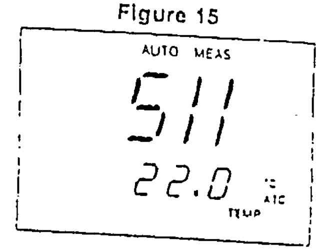
Figure 14



In Figure 14, right, the desired temperature is 22.0°C. Use the ▲ to increase the temperature reading to 22.0°C.

6. Press ENTER/RANGE to confirm your selected correct temperature. The meter reverts to the measurement mode. The meter is now prepared for temperature compensation. See Figure 15, right.

Figure 15



Calibration Error

When an error occurs during the calibration procedure, ERR displays.

For temperature calibration, the "ERR" displays once the calibrated value input exceeds the initial display value by 5°C. The "ERR" also prevents bad calibration technique and improper temperature sensor use.

6. Measurement

The READY mode shows the readings stabilize within a range of +/- 1 unit/15 seconds. When this occurs, the READY annunciator appears on the top left corner of the display. The reading holds until the measured value exceeds the specified range and the READY annunciator turns off.

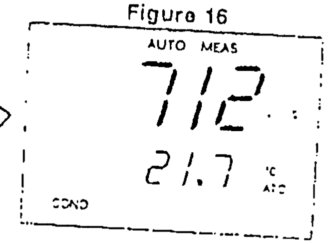
To measure in the mode, do the following:

1. Rinse the electrode with deionized or distilled water before use to remove any impurities adhering to the electrode body.

2. Switch on the meter.

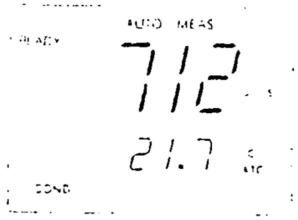
The MEAS annunciator together with the auto-ranging annunciator (AUTO) displays on the top center of the LCD. See Figure 16, right.

Figure 16



[redacted] NO[redacted]hen[redacted]ng t[redacted]ctro[redacted]to th[redacted]nple[redacted]e s[redacted]e tip of the probe is completely immersed into the sample. Stir the electrode gently in the sample to create a homogenous sample. Make sure there are no air bubbles trapped in the slot of the probe. To remove air bubbles, give the probe a gentle shake making sure the electrode tip is submerged.

Figure 17



4. Take readings.

When the reading is stable, a READY annunciator displays. See Figure 17, left.

NOTE: For ATC measurements, attach the temperature sensor connector to the conductivity meter. The ATC annunciator lights up. Insert the probe into the solution to be measured so the sample temperature can be recorded and compensated. Allow a few minutes for the temperature reading to come to equilibrate with the solution.

Hold

1. Press HOLD to freeze a measurement.

When HOLD mode is activated, the HOLD mode annunciator displays.

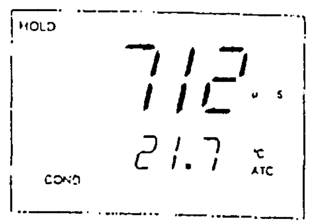
See Figure 18, right.

HOLD

Release a held value

1. Press HOLD again and get "live" readings. The Hold annunciator disappears from the LCD.

Figure 18



Temperature Normalization and Temperature Coefficient

The conductivity of solution varies greatly with temperature. The automatic temperature compensation (ATC) of the conductivity meters adjusts conductivity measurements to eliminate the conductivity changes caused by temperature. Readings are usually referenced to or normalized at a standard temperature (25°C), and ATC gives the corrected readout of the equivalent conductivity solution normalized to 25°C.

[redacted]Prob[redacted]are [redacted] Ma[redacted]nar[redacted]

Keep the conductivity probe clean. Rinse the probe twice, and gently swirl it while you take readings. For the best accuracy, soak a dry probe for at least 5 to 10 minutes or longer before calibration. Wash the probe with deionized or tap water before storing it. Never scratch the platinum portions with a hard substance. Do not strike the probe against any hard surface.

Do not make continuous contact with your solutions. Readings rise over a continuous period of time if you soak your probe.

Do not immerse the probe in oily solutions. Clean the electrode thoroughly by immersing it in an agitated mild detergent bath. Wipe the probe with a soft tissue paper. Wash thoroughly in tap water and then in deionized water. Recalibrate the meter after cleaning it.

8. Error Messages

LCD Display	Indicates*	Cause	Solution
Err. 1 (in primary display)	Memory write error	Instrument too old (>10 years). Hardware failure	Return*
Err. 2 (in primary display)	Memory checksum error	Batteries too weak. Hardware failure.	Press ENTER, then turn off meter. Change batteries. Recalibrate Return*
Err annunciator	Unrecognized input from keypad	Wrong input in selected mode.	Release key. Select valid operations depending on mode.
CAL & Err annunciators blink	Calibration error	Wrong value input at calibration. Dirty probe	Check value, clean probe. See "Probe Care and Maintenance" above.
Err. 3	ADC error	Faulty hardware	Return*
Err. 4	Keypad stuck error	Faulty hardware	Return*

You will see the errors in the primary display (the row of larger digits). To eliminate the errors, switch off the meter and switch it ON again. All keys become inactive. If error persists, or the meter shows incorrect values, return the meter.

* See "Warranty" and "Return of Items"

9. Troubleshooting

Problem	Cause	Solution
Power on but no display	a) Batteries not in place. b) Batteries not in correct polarity. c) Weak batteries.	a) Insert batteries. b) Re-Insert batteries in correct polarity. c) Replace batteries or attach AC adapter.
Unstable reading	a) Dirty probe. b) Low conductivity. c) External noise pickup. d) Broken probe.	a) Clean the probe and recalibrate. b) Avoid atmospheric contact with solution. c) Move away from noise. d) Replace probe.
Not able to calibrate	a) Dirty/Oily probe. b) Incorrect probe cell constant.	a) Clean probe. See "Probe Care & Maintenance", p. 9 b) Replace probe.
"Or" on LCD, printer or computer screen	a) Probe is shorted. b) Probe in too high conductivity solution for range.	a) Check probe b) Use different solution

10. Specifications

	Conductivity	Temperature
Ranges:	0.00 - 19.99 μS	0 - 80°C (Platinum probe)
	0.0 - 199.9 μS	
	0 - 1999 μS	0 - 100°C (Glass/Platinum probe)
	0.00 - 19.99 mS	
	0.0 - 199.9 mS	
Resolution:	0.01 μS	0.1°C
	0.1 μS	
	1 μS	
	0.01 mS	
	0.1 mS	

Accuracy: ±1% F.S.

Cellconstant: 1

Temperature compensation: auto or manual

Reference temperature: factory set at 25°C

Temperature coefficient: factory set at 2% per °C.

Specifications continued

Power: 4 1.5V batteries (AAA), approx. 60 hrs. or 9 VDC unregulated AC adapter

Operating temperature: 0 – 50°C

Dimensions:

- meter: 7.5"L x 3.5"W x 1.75"H (187.5 x 87.5 x 43.75 mm)
- boxed: 9.2"L x 8.5"W x 2.75"H (230 x 212.5 x 68.75 mm)
- probe only: 1/2"Dia. x 5"L with 2.5 ft cable (12.5 x 125 mm)

Weight:

- meter: 1 lb (0.5 kg)
- probe: 0.35 lb (0.2 kg)
- complete kit: 2 lbs (0.9 kg)

11. Accessories

MN-59002-51	110 VAC Adapter
MN-59002-56	220 VAC Adapter
MN-59002-92	Replacement Electrode Holder
MN-01489-41	23 μS Cal. Standard, 1 qt
MN-01491-85	84 μS Cal. Standard, 500 ml
MN-01489-43	447 μS Cal. Standard, 1 qt
MN-01482-70	1413 μS Cal. Standard, 500 ml
MN-01489-44	2070 μS Cal. Standard, 1 qt
MN-01482-71	2764 μS Cal. Standard, 500 ml
MN-01481-52	12880 μS Cal. Standard, 500 ml
MN-19850-00	447 μS Cal. Standard, 20 single use pouches
MN-19850-10	1413 μS Cal. Standard, 20 single use pouches
MN-19850-20	2764 μS Cal. Standard, 20 single use pouches
MN-19850-30	15,000 μS Cal. Standard, 20 single use pouches
MN-19815-50	Replacement cell for 19815-00

The Cole-Parmer Instrument Company warrants this product to be free from significant deviations in material and workmanship for a period of one year from date of purchase. If repair or adjustment is necessary and has not been the result of abuse or misuse within the one year period, please return–freight prepaid–and correction will be made without charge. Cole-Parmer alone will determine if the product problem is due to deviations or customer misuse.

Out-of-warranty products will be repaired on a charge basis.

13. Return of Items

Authorization must be obtained from our Customer Satisfaction Department before returning items for any reason. When applying for authorization, please include data regarding the reason the items are to be returned.

For your protection, items must be carefully packed to prevent damage in shipment and insured against possible damage or loss. Cole-Parmer will not be responsible for damage resulting from careless or insufficient packing. A restocking charge will be made on all unauthorized returns.

NOTE: The Cole-Parmer Instrument Company reserves the right to make improvements in design, construction and appearance of our products without notice.

806-00

Cole-Parmer Instrument Company
625 E. Bunker Court, Vernon Hills, Illinois 60061-1844
1-847-549-7600 or Toll-free 1-800-323-4340
Fax: 1-847-549-7676 Telex: 28-9405

5938-00

Digi-Sense®

Digital

pH / mV / ORP Meter

Operating Manual

Cole-Parmer Instrument Co.
7425 North Oak Park Ave.
Chicago, Illinois 60648
1-708-647-7600
1-800-323-4340

TABLE OF CONTENTS

GENERAL DESCRIPTION

This portable, Digital pH Meter is designed with solid state electronics providing highly reliable operation. The LCD display enables you to read even under bright ambient conditions. It is designed for pH (manual), millivolt and ORP determination.

OPERATING TIPS

For fast response, the glass bulb of the probe should always be kept moist. A rubber cap is supplied with the probe to store a small amount of solution and to cover the glass bulb.

Before use, remove the cap. If the cap has been left off and the tip of the probe is dry, dip the probe in KCL solution for 30 minutes or soak in tap water for 2 hours.

When the electrode is not in use, replace the cap which should be filled with KCL or equivalent probe storage solution. If a solution is not available, use tap water.

NOTE: Do not use distilled or deionized water for storing, under any circumstances.

Front Panel Controls

The features on the front panel are:

1. ON/OFF key
2. (pH/mV) key
3. SLOPE adjustment
4. Manual temperature adjustment
5. Standardize control
6. pH probe input
7. LCD display

pH Calibration

Calibration with manual temperature compensation.

1. Press ON/OFF key to turn meter on.
2. Connect the pH probe to the meter.
3. Immerse the probe in buffer 7.00.
4. Press the pH/mV key to select pH.
5. Adjust temp °C control to the temperature of buffer 7.00.

NOTE: A separate thermometer is needed to measure the temperature of the buffers. Both buffers should be at the same temperature.

6. Adjust the standardize control to read 7.00 pH on the display.
7. Rinse the probe with distilled water and blot dry.
8. Immerse the probe in the second buffer (4.00 or 10.00).
9. Adjust the temp °C control to the temperature of the second buffer.
10. Allow the reading to stabilize, then adjust the SLOPE control to the value of the second buffer.
11. Rinse the probe with distilled water.

Calibration is now complete.

OPERATION

1. Push the ON/OFF key to turn the meter on.
2. Push the pH/mV key until the annunciators indicate the desired mode.

For pH measurement: Rinse the probes with distilled water, then immerse the probe in the solution to be measured. The pH value will stabilize after a few seconds. Do not rub the bulb as this will cause static build-up on the bulb resulting in faulty readings.

Temperature Compensation

Temperature compensation can be set manually by the temperature °C adjustment over a range of 0° to 100° C.

For millivolt or ORP measurement: Press the pH/mV key until the display shows millivolts. Verify the probe connection, then rinse the probe with distilled water and blot dry. Immerse the probe in the sample to be measured. Allow the displayed reading to stabilize, then take the reading.

Battery Replacement

The pH meter uses a 9 volt battery with a life of 2000 hours. If the low battery indicator is on, stop operation and replace the internal battery with a new 9 volt battery.

Cleaning the Probe

The glass bulb is the sensitive part of the probe, it should always be kept clean. Rinse the probe with distilled water after use. Before storage, rinse the probe with tap or distilled water, shake dry and place the probe in the protective cap which should be filled with a KCL solution or equivalent probe storage solution.

If KCL or equivalent storage solution is not available, use a 4.00 pH buffer, 7.00 pH buffer or tap water.

NOTE: Distilled or deionized water should never be used.

TROUBLESHOOTING GUIDE

SYMPTOMS	PROBLEM	POSSIBLE SOLUTION
Meter will not calibrate or gives erroneous readings	Defective pH probe, bad buffer, or incompatible sample	1. Change buffer 2. Check chemical compatibility 3. Replace pH probe
Unit gives slow response or erroneous readings	Dry electrode or clogged reference junction in pH probe	1. Clean the probe 2. Replace pH probe
Meter will not accept second buffer	Defective pH probe or bad buffer	1. Change buffers 2. Clean probe 3. Replace probe
Reading drift on display	Bad pH probe or incompatible sample being measured	1. Clean probe 2. Check chemical compatibility of sample with probe 3. Replace probe
Lo Bat Indicator is lit	Low Battery	Replace battery

SPECIFICATIONS

Ranges:	
pH:	0.00 to 14.00
mV:	-1999 to +1999
Resolution:	
pH:	0.01
mV:	1. mV
Accuracy:	
pH:	±0.01 pH
mV:	±1 mV
Temp Compensation:	Manual, from 0° to 100° C
Battery:	9 volt (included) battery life: 2000 hrs.
Display:	4 digit LCD, 1/2" high
Input Impedance:	Greater than 10^{11} ohms
Dimensions:	6 5/8"L x 3"W x 29/32"D

WARRANTY

We warrant this product to be free from defects in material and workmanship for the period noted in the enclosed Warranty Card. If repair or adjustment is necessary, which has not been the result of abuse or misuse within the warranty period, please return, freight prepaid. Correction of the defect will be made without charge. (See Return of Items below.)

For your protection, items being returned must be *carefully* packed to prevent damage in shipment. Also *insure* against possible damage or loss. We will not be responsible for damage resulting from careless or improper packing.

Out-of-warranty products will be repaired for a nominal charge.

RETURN OF ITEMS

Authorization must be obtained from your Dealer before returning items for any reason. When applying for authorization, please include the reason the items are to be returned.

TECHNICAL ASSISTANCE

Technical Information and advice concerning the use of the product in specific applications may be obtained. Modifications can often be made to adapt the unit to special applications. Contact your Dealer for Information.

The manufacturer reserves the right to make improvements in design, construction and appearance of the product without notice.

Upon receipt of meter the following operational checks should be performed:

1. Set toggle switch to "on" or turn rotary dial fully clockwise.
2. Submerse the electrode (probe) in tap water. This completes the circuit and activates the buzzer.
3. Depress button to test the battery and circuitry (excluding the probe).

Water Level Measurement

<u>The zero measurement point is:</u>

Model 101: tip of the inner electrode visible near the centre of the probe

Model 102: base of the outer body electrode.

- clockwise rotation of rotary dial turns meter on and increases sensitivity.
- always set switch to the highest sensitivity position, then decrease if necessary.

Note: The P4 Probe has been designed to allow substantial submergence. Use of the P1, P2 or P3 probes to sound the bottom of the well may cause water to enter the probe.

Routine Care of the Water Level Meter

1. After the depth of water has been recorded the cable should be carefully rewound onto the reel, the probe wiped dry and replaced into the probe holder.
2. The probe, cable and reel can all be cleaned with soap or detergent and water.
3. Use of a Water Level Meter Carrying Bag adds to the service life of the meter.
4. Use of the Tape Guide adds to the life of the tape.

Care of the P4 Probe

Note: Do not remove or twist the strain relief pieces at the back of the probe as this will cause damage to the pressure seal. If the pressure seal integrity is in question, please call Solinst for the authorized repair centre nearest you.

1. While holding firmly onto the black Delrin section on the top of the probe, turn clockwise slightly and pull the P4 sleeve body down.
2. Remove any dirt and water from inside the sleeve body, the centre electrode and the Teflon® pieces.
3. Remove and clean the o-rings. Clean the recessed areas and check the o-rings for damage. Lightly lubricate and replace the o-rings.
4. Carefully pull the coil spring from its recessed area and onto the centre electrode. The coils of the coil spring must curve clockwise.
5. Clean the recessed area where the coil spring rests and check to see that the exposed wire is in place and clean.
6. Push the coil spring back into place.

7. Turning clockwise, push the sleeve body over the electrode to the black Delrin piece.
8. To test, turn the unit on and lower the probe into a glass of water. When the probe touches water, the buzzer will sound and the light will come on.

Troubleshooting

SYMPTOM	CAUSE	REMEDY
Non sound when probe immersed in water.	Dead battery.	Replace with 9V Alkaline.
	Water conductivity is very low.	Increase sensitivity switch setting (turn clockwise) or call Solinst for assistance.
	Disconnected wires on circuit board.	Check all connections inside hub of reel for loose/disconnected wires - solder or reconnect.
	Broken wire in tape.	Locate break in tape - splice and seal.
	Disconnected wire inside probe.	Contact Solinst to obtain parts/ repair instructions.

Battery Replacement

- battery type - alkaline, 9 volt.

1. The battery is housed in the reel hub and is replaced by removing the front plate of the reel.
2. To remove front place, unscrew three faceplate screws and carefully lift off to the side to avoid damage to wiring.
3. Remove battery and put in new one, making sure the polarity is correct.
4. Replace faceplate of the reel and screws, making sure the wires are fully inside.

Water Level Meter Replacement Parts

The following parts can be provided should they become lost or damaged.

- probes and probe tips
- tapes and cables
- cable reels
- lights, switches, etc.

For further information contact: Solinst Canada Ltd.
Fax: (905) 873-1992 Tel: (905) 873-2255 or (800) 661-2023
35 Todd Road, Georgetown, ON Canada L7G 4R8
E-mail: instruments@solinst.com

OPERATING MANUAL

MASTERFLEX® L/S™

PORTABLE SAMPLING PUMP DRIVES

Model No.
7570-10
7570-15

Serial #- J97003880

Cole-Parmer Instrument Co.
625 East Bunker Court
Vernon Hills, Illinois U.S.A. 60061-1844

800-MASTERFLEX (627-8373)
(847) 247-2929 (FAX)

A-1299-0157
Edition 13

Cole Parmer

ISO 9001
VENDOR CERTIFIED

WARNING: PRODUCT USE LIMITATION

This product is not designed for, nor intended for use in patient connected applications; including, but not limited to, medical and dental use, and accordingly, have not been submitted for FDA approval.

SETUP AND DRIVE OPERATION

INTRODUCTION AND GENERAL DESCRIPTION

This portable sampling pump drive when used with a *MASTERFLEX® L/S™* pump head is designed for battery operated fluid transfer/ sampling in field applications. The drive can be operated on the internal battery, an external 12VDC source or on a 115VAC (or 230VAC) power.

VARIETY OF PUMP HEADS ACCEPTED

Mount 1 *MASTERFLEX® L/S™* pump head. See individual pump heads for flow rates and torque requirements.
Best suction lift performance with L/S™ Standard pump heads (esp. 7015, 7024).
NOTE: Use only MASTERFLEX L/S C-FLEX® or Silicone tubing.

SETUP AND DRIVE OPERATION

1. Unpack the drive, save packing material until proper product operation has been verified.
2. Mount pump head and load tubing (see pump head manual).
3. Select motor direction CW/CCW. Pump operates the same in each direction. When changing directions, turn power off first.
4. Select type of operation.
   NOTE: Front power switch controls both pump operation and recharging:

   TO OPERATE PUMP WITH INTERNAL BATTERY
   (fully charge unit before using the first time—See MAINTENANCE)
   a. Turn power switch to "OFF".
   b. Set selector switch to "INTERNAL BATTERY OPERATION".
   c. Turn power switch to "ON".

   TO OPERATE PUMP WITH EXTERNAL 12V BATTERY
   a. Turn power switch to "OFF".
   b. Set selector switch to "12VDC OPERATION".
   c. Attach cable to drive and cigarette lighter socket (center terminal is positive).
   d. Turn power switch to "ON".

   TO OPERATE PUMP WITH AC
   a. Turn power switch to "OFF".
   b. Set selector switch to "AC OPERATION".
   c. Attach cable to drive and a standard outlet.
   d. Turn power switch to "ON".

5. Adjust flow rate with the 1-turn potentiometer speed control.

Battery Life

The pump can be operated with the internal batteries for approximately 2-1/2 hours using the L/S™ size 15 tubing or smaller. The larger tubing sizes will consume more power and thereby operate for a shorter time. A test light and push button switch are provided to give a visual indication of the battery's condition.

Test Light

A test circuit provides a visual indication of internal battery condition. Push "test" switch (on the front panel) while the pump is rotating at full speed.
If light turns ON, the batteries are satisfactory.
If the light does NOT turn on, the batteries are low and should be recharged.

(NOTE: Always test batteries before extended internal battery operation.)
(NOTE: Batteries only charge in the AC or 12VDC recharge mode, not during 12VDC or AC operation.)

Suction Lift

Any L/S pump head with silicone and C-FLEX® tubing can be used to pull samples up to 12-15 ft (4.5 m). When lifting samples greater than 5 ft (1.5 m), some reduction in flow will exist. For best performance, the L/S Standard pump heads 7015-21 and 7024-21 are recommended. Using these pump heads, water can be raised up to 29 ft (8.8 m) from shallow wells.

When pulling samples from great distances, use thick wall or rigid tubing for extension tubing. This helps to prevent the tubing from collapsing when lifting great heights. The optional tubing weight also helps to straighten out the tubing when sampling from shallow wells or lake sites.

Reminder: When sampling from a boat or dock location, the pump only needs to pull the sample up from the surface of the water. The hydrostatic water pressure at the lower depths will cause the water to rise inside the tubing, to the surface of the lake. This combination permits the sampler to draw liquids from depths greater than 29 ft (8.8 m).

CAUTION: Tubing breakage may result in fluid being sprayed from pump. Use appropriate measures to protect operator and equipment.

MAINTENANCE

The only item requiring regular maintenance are the batteries. There are no serviceable parts on the internal motor or control circuits.
The batteries will partially discharge if the unit is not used for long periods of time. It is recommended that the sampler be given at least one complete cycle (operate 2 hours, then recharge overnight with AC) once every six months to maintain batteries at their fully charged capacity.

RECHARGING THE BATTERIES

A recharging circuit is provided in the unit. The circuit protects against overcharging of the batteries.
Select method of recharging.

TO RECHARGE PUMP WITH AC (Best Method)

a. Turn power switch to "OFF".
b. Set selector switch to "RECHARGE ON AC".
c. Attach cable to drive and a standard outlet.
d. Turn power switch to "ON".

The internal batteries will be fully recharged in approximately 15 hours on an AC circuit. The "RECHARGED" light on the lower left front will indicate a fully charged condition. It is recommended to turn power off within 8 hours after light indicator illuminates. Extended operation causes internal heating and potential premature failure of the circuit.

TO RECHARGE PUMP WITH EXTERNAL 12V BATTERY

a. Turn power switch to "OFF".
b. Set selector switch to "RECHARGE ON 12VDC".
c. Attach cable to drive and cigarette lighter socket (center terminal is positive).
d. Turn power switch to "ON".

(NOTE: Batteries may not fully recharge in all 12V car systems, due to the variety of circuits available. This capability is designed to extend the internal battery's operating life in the field. The recharge light does not function when recharging with 12 VDC.)

(NOTE: If the batteries are severely discharged, the AC circuit will not recharge and the light will turn on instantly giving a false indication of a fully charged battery. If this occurs, partly recharge the batteries with a 12VDC source before using AC charger.)

CLEANING

Keep the drive enclosure clean with mild detergents. Never immerse nor use excessive fluid.

FUSE REPLACEMENT

The motor is protected by a 2.5 A fuse. A separate fuse protects the AC line into the recharge circuit. Replace fuse(s) on back of drive with the correct value.

BATTERY REPLACEMENT

DANGER: Use caution when servicing internal components.

1. Place the POWER SWITCH in the off position.
2. Disconnect the power input cords from the back of the drive.
3. Remove the screws from each side of the housing and slide off the housing.
4. Disconnect batteries and replace.
5. Reattach housing with screws.
6. Fully charge the batteries — See RECHARGING THE BATTERIES.

TROUBLESHOOTING

1. If drive does not operate, disconnect power:
   a. check pump head for tubing jam,
   b. test battery—See TEST LIGHT section,
   c. check battery and power connections.

2. If drive does not charge, disconnect power:
   a. check cord connections,
   b. check fuses — see MAINTENANCE, FUSE REPLACEMENT,
   c. check drive gear for stripping.

Contact your dealer for further service needs.

REPLACEMENT PARTS AND ACCESSORIES

MN-07578-60, Replacement Batteries with connector, Pack of two
MN-77500-09, Replacement Fuse, 2.5A/125V Slow Blo, Pack of two
MN-77500-20, Replacement Fuse, 0.25A/250V Slow Blo, Pack of two (protects AC line for model 07570-10 only)
MN-07570-24, Replacement Fuse, 0.125A/250V Slow Blo, (protects AC line for model 07570-15 only)
MN-07570-22, Replacement transformer, 230VAC stepdown; for model 07570-15
MN-07570-04, Flow-through tubing weight, SS. Prevents curling or floating of tubing. Fits size 15 best. Fits easily into 1" diameter opening.

SPECIFICATIONS

Operating Temperature:	0° to 40° C
Storage Temperature:	-10° to 65° C
Chemical Resistance:	Exposed material is painted CRS, aluminum and plastic
Line Voltage Limits:	100-130V or 200-260V; 50-60Hz
Power Output:	15W (1/50 hp)
Maximum Current:	2.5 A
Maximum Torque:	3kg-cm (36 oz-in)
rpm Range:	1 to 400
Speed Regulation:	±10%
Enclosure Rating:	IP22 per IEC 529
Humidity (non-condensing):	10% to 99%
Altitude:	Less than 2000 m.
Reversible:	Yes
Dimensions (L x W x H):	240 x 294 x 179mm (9 7/16 in x 11 9/16 in x 7 1/16 in)
Weight:	8.6 kg (19 lbs): 7570-10 9.5 kg (21 lbs): 7570-15

WARRANTY

Use only MASTERFLEX precision tubing with MASTERFLEX pumps to ensure optimum performance. Use of other tubing may void applicable warranties.

The manufacturer warrants this product to be free from significant deviations from published specifications. If repair or adjustment is necessary within the warranty period, the problem will be corrected at no charge if it is not due to misuse or abuse on your part, as determined by the manufacturer. Repair costs outside the warranty period, or those resulting from product misuse or abuse, may be invoiced to you.

The warranty period for this product is noted on the Warranty Card.

PRODUCT RETURN

To limit charges and delays, contact the seller or manufacturer for authorization and shipping instructions before returning the product, either within or outside of the warranty period. When returning the product, please state the reason for the return. For your protection, pack the product carefully and insure it against possible damage or loss. Any damages resulting from improper packaging are your responsibility.

TECHNICAL ASSISTANCE

If you have any questions about the use of this product, contact the manufacturer or authorized seller.

Printed in U.S.A.
130297

Appendix B

Laboratory QAPP

Weaver Boos Consultants, Inc.

200 South Michigan Ave.
Chicago, Illinois 60604
(312)922-1030
Fax (312)922-0201

S·I·M·A·L·A·B·S
INTERNATIONAL

February 16, 1998

RECEIVED
FEB 17 1998
Weaver Boos Consultants, Inc

Mr. Mike Maxwell
Weaver Boos Consultants
200 South Michigan Suite 900
Chicago, Il 60604

RE: QAPP modifications for Feddeler C/D Landfill

Dear Mike,

Please find enclosed a copy of our Analytical QAPP for the above referenced project. All modifications have been made.

If you have any other questions regarding this project, please feel free to contact me or our Laboratory Manager Tom Bauer.

Sincerely,

John S. Sima
President

250 West 84th Drive, Merrillville, IN 46410 TEL.800.536.8379 TEL.219.769.8378 FAX.219.769.1664

SIMA·LABS
INTERNATIONAL

LABORATORY QUALITY ASSURANCE PROJECT PLAN (QAPP)

Revision 4.1
February 16, 1997

250 West 84th Drive, Merrillville, IN 46410 TEL.800.536.8379 TEL.219.769.8378 FAX.219.769.1664

TABLE OF CONTENTS

1.0 PROGRAM DESCRIPTION

1.1 This program was designed to insure the quality and integrity of data generated by SIMALABS International. The requirements herein apply to all personnel with the organization that directly or indirectly generate analytical results.

It is our responsibility to generate data where the level of precision, accuracy, completeness and representativeness are known and documented. This responsibility is held by all personnel of the organization, and assured with constant oversight by management.

This document discusses all aspects of the laboratory operation and its personnel. Discussion of quality control limits, responsibilities, audits and pertinent procedures are contained within.

Due to the constantly changing nature of our business, the contents and limits discussed may change. SIMALABS International believes in continually improving our operations. Documentation of these improvements will be handled through revision of this document.

As of the date of last revision on this QAPP, the contents can be considered policy of SIMALABS International. Management and staff level personnel will strive in every way to insure that its contents are accurate and upheld for all data generated.

2.0 ORGANIZATION AND RESPONSIBILITY

2.1 Introduction

The laboratory QAPP is under the direct supervision of the Quality Control Officer (QCO). His decisions concerning the validity of data are final and receives complete support of the company's President. Any questions concerning the validity of the data will be addressed to its origin and the Assistant Laboratory Manager will take immediate action to correct.

The complete organization structure of SIMALABS International is shown in Figure 2.1.

2.2 Support

2.2.1 *President/Laboratory Manager*: Oversees all operations within the organization. He enforces the guidelines of the QAPP through the Laboratory Manager.

2.2.2 *Assistant Laboratory Manager:* Controls production of all analyses and oversees that the correct procedures are implemented. He also reviews the final reports before going to the client.

2.2.3 *Quality Control Officer:* Reviews and approves all data generated by laboratory personnel, maintains control charts and Quality Control records documenting blanks, duplicates, spikes and all other aspects of the QAPP.

2.2.4 *Sample Custodian:* Signs in all samples and determines that all Chain of Custody (COC) forms are properly filled out. He stores all samples and distributes them to proper personnel daily.

2.3 Resumes of Personnel

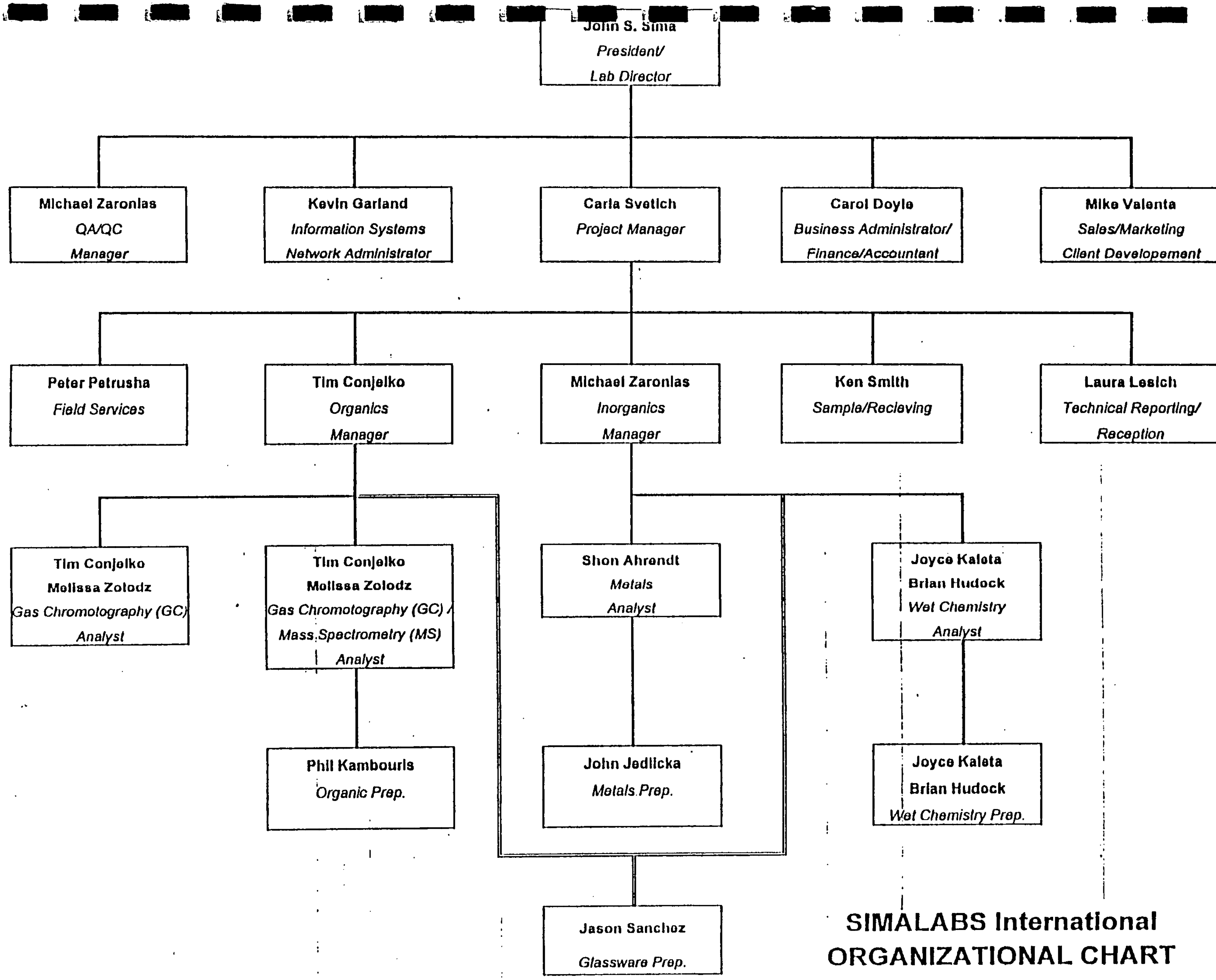
See following pages.

quipment List

Instrument	Manufacturer	Model	Date of Purchase	Detectors
iC/MS	Hewlett Packard	5971 / 5890 Series II	1991	MSD
C/MS	Hewlett Packard	5971 / 5890 Series II	1992	MSD
C	Hewlett Packard	5890 Series II	1991	FID/ECD
C	Hewlett Packard	5890 Series II	1995	ECD
C	Hewlett Packard	5890 Series II	1995	FID
'urge & Trap	Tekmar	LSC2000 / ALS2016	1991	N/A
PLC	Perkin-Elmer	250 Binary Pump 235C - Photodiode Array LC240 - Fluorescence	1993	PDA / Fluorescence
P	Thermo Jarrel Ash	IRIS	1994	CID
A	Varian	SpectrAA 400	1993	Furnace
A	Varian	SpectrAA 20 +	1992	Flame/CV
R	Perkin Elmer	683 - IR	1991	IR
ectrometer	Milton Roy	Spectronic 20D	1991	Spec
A Automated on Analyzer diDist	Lachat	QuickChem 8000	1996	Photometric / Conductivity
oncentrator	Zymark	TurboVap II	1995	N/A
alytical lance	Mettler	AE - 100	1991	N/A
Top Loading lance	Mettler	XL - 1800	1994	N/A
op Loading lance	Mettler	XL - 500	1994	N/A
Meter	Fisher Scientific	Accumet pH Meter - 25	1994	N/A
Horn - type Probe nicator	Bransen	Sonifer 450	1994	N/A
ath Sonicator	Fisher Scientific	Ultrasonic FS - 14	1991	N/A
ntrifuge	Int'l Equipment Co.	Centra - HN	1991	N/A
en	Fisher Scientific	655 - F	1994	N/A
Oven	Baxter / S - P	NB620 - 10A	1991	N/A
rnace	Thermolyne	1300	1992	N/A
CLP Agitator	Analytical Testing	8 Station	1991	N/A
HE Extractors	Analytical Testing	Pressured Stain. Steel	1991	N/A
LP Filtration Device	Analytical Testing	Pressured Stain. Steel	1991	N/A
shpoint paratus	Precision Scientific	24537	1991	N/A
acuum System	Welch	1376	1994	N/A
ne Hoods	Fisher Hamilton	Various	1991 to 1994	N/A

addition to the above, a diagram of SIMALABS International facilities can be found attached to this proposal as Appendix C

SIMALABS International ORGANIZATIONAL CHART



Revised 01/20/97

JOHN S. SIMA
President/Laboratory Director

EDUCATION:

B.S., Chemistry, University of Iowa, Iowa City, Iowa, 1986

PROFESSIONAL ASSOCIATIONS:

American Chemical Society

Federation of Environmental Technologists, Inc.

International Association of Environmental Laboratories

PUBLICATION:

"Antiinsectan Aflaninine Derivatives from the Sclerotia of Aspergillus Flavus"; James B. Gloer, Mark R. TePeske and John S. Sima; the Journal of Organic Chemistry, 1988, Vol. 53.

EXPERIENCE:

Mr. Sima, as President and Laboratory Director for SIMALABS International, has the responsibilities for the overall management of office and laboratory. Mr. Sima currently manages the operation of the laboratory which consists of the production, method development, QA/QC, finances, reports, purchases and marketing.

Since opening his own laboratory in 1991, Mr. Sima has developed numerous analytical projects including those for clientele such as Avery International, American Steel Foundries, BorgWarner Automotive, Bethlehem Steel Corporation, Crown International, Inc., Hammond Lead Products, Inc., Knauf Fiber Glass, McGill Manufacturing, National Standard Company, National Steel Corporation, Riverwood International (Division of Monsanto) and Urschel Laboratories. He has also developed a clientele base of many environmental engineering firms as well. Mr. Sima developed a relationship with IDEM through the first four years of SIMALABS International which contributed to a contract award in 1995.

Before forming A_2I, Mr. Sima managed the laboratory for ATEC Associates, Inc. in Griffith, Indiana for one year and worked in ATEC's Indianapolis laboratory for four years. His experience at ATEC Associates, Inc. included operating several pieces of instrumentation, including GC-FID for Total Petroleum products, GC-ECD for PCB/Pesticides analysis, GC/MS for Volatile and Semi-Volatile organic compounds, Atomic Absorption for Trace Metal analysis and various wet chemistry devices. Mr. Sima also managed the GC/MS department for one year.

While at ATEC, Mr. Sima had opportunities to work with project engineers which gave him valuable knowledge in UST, RCRA and CERCLA projects. Those projects included many clients such as Illinois Bell, AT & T, W.W. Grainger, Westinghouse (Bloomington, Indiana), F.M.C. Corporation, Indiana Naval Weapons Support Center, IDEM, Gillette and many other clients.

Prior to his association with ATEC, Mr. Sima was employed by the University of Iowa Hygenic Laboratory where he had the opportunity to work for the U.S. EPA using strict CLP Protocol. Mr. Sima's responsibilities included Organic preparation of Semi-Volatiles, PCB's and Pesticides. He also operated the GC/ELCD/PID instrumentation for Volatile Halocarbons analysis.

MICHAEL ZARONIAS
Chemist

EDUCATION:

B.A., Chemistry, Indiana University, Northwest, Gary, Indiana, 1989

EXPERIENCE:

Mr. Zaronias is currently responsible for running the laboratory quality control program. His background in organics and inorganics allows him to monitor the quality of all analysis conducted. He monitors data quality using control charting. Mr. Zaronias is responsible for guaranteeing adherence to the QAPP through audits, PE samples, and data review. The results of his efforts are reported to management on a regular basis.

Mr. Zarionias analyzed samples for PCB's and Pesticides using GC and TPH samples by GC and IR. He has some training for the analysis of SVOC's and VOC's. Mr. Zaronias has experience in extracting soil, sludge and aqueous samples for PCB/Pesticides, SVOC, PNA and Herbicides analysis.

Mr. Zaronias was responsible for operation and maintenance of the Graphite Furnace Atomic Absorption Spectrometer, Inductively Coupled Plasma Spectrometer, and preparation of standards and digestates for metals analysis.

Additionally, Mr. Zaronias was responsible for overseeing analysis for cyanide, phenol, ammonia, nitrates, phosphorus, fluoride, chloride, sulfate and various other wet chemistry techniques.

Mr. Zaronias was previously employed by Northern Laboratories, an environmental laboratory, for nearly two years. He prepared samples for analysis by ICP, GFAA, FLAA and Cold Vapor Technique. Mr. Zaronias operated a Thermal Jarrell Ash ICP 9000, Perkin Elmer GFAA 5100 and Varian GFAA 400. He acquired a strong background in environmental testing using CLP Protocol.

Throughout his years as a chemist, Mr. Zaronias has had opportunities to work for clients such as U.S. EPA, Indiana Department of Environmental Management, U.S. Steel Corporation, Indiana Industrial Plating, Rockwell, Hammond Lead Products, Inc. along with many other clientele.

Prior to working for Northern Laboratories, Mr. Zaronias was a laboratory assistant at IUN, where he supervised and instructed students with laboratory techniques in the Organic chemistry lab.

Mr. Zaronias has over seven years experience as a chemist.

TIM CONJELKO
Chemist

EDUCATION:
B.S., Biochemistry, Purdue University, West Lafayette, Indiana, 1990

EXPERIENCE:
Mr. Conjelko is responsible for operation and maintenance of the Gas Chromatograph Mass Spectrometer systems for SIMALABS International. He is also responsible for operation and maintenance of a Gas Chromatograph having a Flame Ionization Detector and an Electron Capture Detector along with a High-Performance Liquid Chromatograph having a UV and Fluorescence Detector. His five years of experience at includes qualitative and quantitative analysis of priority pollutants and hazardous substances as labeled by the U.S. EPA according to current U.S. EPA CLP Protocol. In addition, Mr. Conjelko has the responsibility of prepping samples of different matrices using Liquid/Liquid and Liquid/Solid extraction methods.

Mr. Conjelko was previously employed by ATEC Associates, Inc. for one year at their Griffith, Indiana location. He was responsible for operation and maintenance of the Gas Chromatograph PID/ELCD, analyzing for Volatile Organic compounds and Total Petroleum Hydrocarbons. He also operated the Dohrmar TOC and TOX analyzer, screening samples for Organic Carbon and Organic Halides. He prepared samples of different matrices using Liquid/Liquid and Liquid/Solid extraction methods.

Mr. Conjelko has had opportunities to work on analytical projects including those for clientele such as National Steel Corporation, Illinois Bell, Shell Oil, W.W. Granger, Cook County, Illinois, Knauf Fiber Glass, Riverwood International (Division of Monsanto), Northern Indiana Public Service Company, Avery-Dennison and many other clients.

SHON AHRENDT
Chemist

EDUCATION:
B.S., Biology, Purdue University, West Lafayette, Indiana, 1991

EXPERIENCE:
Mr. Ahrendt's present duties include operation and maintenance of the Graphite Furnace, Cold Vapor Atomic Absorption Spectrometer and the Inductively Coupled Plasma. He is responsible for priorization of metals digestion, wet chemistry analysis and training all personnel conducting these procedures. Mr. Ahrendt has gained over two and a half years experience in analyzing environmental samples for metals.

After graduation, Mr. Ahrendt began working at SIMALABS International conducting Liquid/Liquid and Liquid/Solid extractions for Organic analyses. He was additionally responsible for preparation of TCLP Leachates. Mr. Ahrendt was trained on analysis of all wet chemistry tests and metals digestion. He acquired one year experience in analysis of wet chemistry parameters, preparation of organic and inorganic samples, and TCLP extraction procedures.

Mr. Ahrendt has had the opportunity to work on projects for major manufacturing and industrial accounts. He has additionally worked on projects for government, municipal and consulting engineering accounts.

JOYCE KALETA
Analyst

EDUCATION:
B.S., Biology, Purdue University - North Central, Westville, Indiana, May 1995, Summa Cum Laude

EXPERIENCE:

Ms. Kaleta's present duties include the supervision of the wet chemistry department. She conducts all spectrophotometric and FIA (Lachet) analysis. She also performs gravimetric and titrimetric analysis, and prepares reagents, standards, and samples.

Ms. Kaleta was responsible for the digestion of samples for metals analysis and TCLP extraction. She was being trained on analysis of wet chemistry tests. She also can assist with organic extractions under the supervision of a trained chemist.

As an undergraduate student at Purdue North Central, Ms. Kaleta assisted in the preparation of precursors for an experimental hydroxyl protecting group for oligoribonucloetide synthesis. This research project was directed by and funded through the Biochemistry department of Purdue University in West Lafayette, Indiana. She was also employed by Purdue North Central as a math tutor.

Ms. Kaleta has gained over two years experience in digestions and TCLP extraction.

MELISSA ZOLODZ
Chemist

EDUCATION:
B.S., Chemistry, Indiana University Northwest, Gary, Indiana, 1996

EXPERIENCE:
Ms. Zolodz currently analyzes extracts for PCB's, which includes cleanup of the extracts and preparation of standards. In addition, Ms. Zolodz analyzes samples for total organic carbon and halides (TOC) , (TOX). She is training on the GC-MS instrument and under Mr. Conjelko's supervision analyzes samples for BTEX.

She is responsible for prepping extracts for analysis of pesticides, semivolatiles, PNA's and TPH. She also has experience in liquid/liquid and liquid/solid extractions.

Ms. Zolodz began working in the wet chemistry department. Her responsibilities included distillations, such as, cyanide and phenols, titrations, BOD and COD, and gravimetric tests.

Ms. Zolodz was previously employed at IUN through an undergraduate research grant. Her project was "Ultrasound in Organic Synthesis: Preparation of Alkynyl Iodonium Salts and Alkynyl Sulfonate Esters." Her responsibilities in this project included preparing, testing, and improving new synthesis methods using ultrasound. She also analyzed the salts and esters using H^1 and C^{13} NMR and IR. She presented her results at the Undergraduate Research Conference at Butler University, Indianapolis, IN in 1995 and 1996, and at IUN in 1996. The results for the Alkynyl Iodonium Salts have been submitted for publication to Tetrahedron Letters. The results for the Alkynyl Sulfonate Esters will be submitted in the future for publication.

BRIAN A. HUDOCK
Chemist

EDUCATION:

B.S., Chemistry, Indiana University Northwest, Gary, Indiana, 1996

EXPERIENCE:

Mr. Hudock is responsible for conducting wet chemistry analysis. He analyzes a variety of samples using, gravimetric and titrimetric tests. These include total, dissolved, and suspended solids, oil and grease, chloride, acidity and alkalinity. Mr. Hudock distills samples for cyanides, sulfides, and phenols. He also performs biological oxygen demand and chemical oxygen demand tests.

Mr. Hudock was hired recently in 1996 following the completion of his college studies.

JOHN C. JEDLICKA
Analyst

EDUCATION:
B.S., Nuclear Engineer, University of Missouri, Rolla, Missouri, 1973

EXPERIENCE:
Mr. Jedlicka's present duties include the digestion of waters, soils, sludges and TCLP extracts for metals analysis by GFAA, Cold Vapor, and ICP. Mr. Jedlicka has also been trained to setup samples for TCLP and ZHE extraction.

As an engineer he worked for Bechtel Power Corp. designing Nuclear power plants as well as a licensing engineer involved in coordinating all facets of Q.A. design reporting to the Nuclear Regulatory Commission.

He later acted as design supervisor for a coal fired, industrial, co-generation power plant for a large international manufacturing company.

John also served as instruction supervisor at Memphis State University, where he supervised the development of a 80 week Basic Nuclear Reactor Operator's course and authored or edited 11 text books on mathematics, physics, chemistry, and nuclear reactor fundamentals.

PHIL KAMBOURIS

Technician

EDUCATION:
B.S., Biology, Purdue University Calumet, Hammond, Indiana, Expected 1997

EXPERIENCE:

Mr. Kambouris is responsible for the extraction of organic compounds. This includes pesticides, PCB's, SVOA's, PNA's, herbicides and TCLP extracts. He is also knowledgeable is the setup of TCLP and ZHE.

Mr. Kambouris was responsible for field sampling and pick-up at numerous facilities throughout the Midwest. He has been trained in the operation of ISCO samplers for composite and storm water sampling.

KEN SMITH

Sample Custodian

EXPERIENCE:

January 1994 to Present, SIMALABS International. - Merrillville, Indiana
Since joining SIMALABS International, Mr. Smith has been responsible for sample custody activities. His responsibilities include sample receipt, log-in, internal COC, disposal, shipping, and receiving. Mr. Smith was trained by company management as to the proper custody procedures, and has acquired over 2 years experience in these procedures.

Carla E. Svetich

Project Manager

EDUCATION:

A.A., Accounting, International Business College, Fort Wayne, Indiana, 1988

EXPERIENCE:

Ms. Svetich, as project manager for SIMALABS International is responsible for the oversight of projects. Ms. Svetich responsibility is tracking samples from the time of receipt to the time of reporting of data. She works together with the laboratory Manager, Sample Custodian, QA/QC officer and Reporting Staff. She versifies all information for the projects and transfer the information to the appropriate parities which includes but not limited to Parameters Requested, Reporting Limits, Data Quality Levels, Holding Times and Due Dates. She also corresponds with all Clients verifying their request.

Also, since 1991 Ms. Svetich has been working with all departments which includes Sample Receiving, Reporting, Organics, Inorganics, Wet Chemistry, Accounting, and Purchasing.She has developed proper SOP's, for each area pertaining to Client Services.

KEVIN A. GARLAND

Network Administrator

EDUCATION:

B.S. Systems Networking, Purdue University, Hammond, Indiana, Expected 1998

A.S. Information Systems & Computer Programming~~, Purdue University, Hammond, Indiana, 1995~~

Electrical/Computer Engineering courses, Purdue University, West Lafayette, Indiana 1988 -1992

PROFESSIONAL ASSOCIATIONS:

International Association of Electronic and Electrical Engineers (IEEE)

American Society of Computer Professionals (ASCP)

EXPERIENCE:

March 1996 - Present, American Analytical, Inc (A_2I) - Merrillville, Indiana

Mr. Garland, as Network Administrator for A_2I has the responsibilities of maintaining the company's PC network running NeXT's Mach operating system. Duties include administration of all user accounts, computer processes, and peripherals. Additional responsibilities include management of Sybase database system, specialized application development, end-user support, and troubleshooting any software or hardware problems.

1993 - 1996 Indiana Federal Bank for savings - Valparaiso, Indiana

Before coming to A_2I, Mr. Garland was a Unix System Administrator for Indiana Federal Bank. His experience there included the administration of an RS/6000 computer network running IBM's AIX operating system, managing an Informix database system, and developing all specialized database applications. Also, he maintained ATM software, managed a twelve-line voice response unit, generated all departmental reporting, provided end-user support, and troubleshooted any software or hardware problems.

CAROL A. DOYLE
Office Manager

EDUCATION:
B.S. in Business Administration with emphasis in Management and Math (1994) and Paralegal Certification (1987), Robert Morris College, Pittsburgh, Pennsylvania, 1994.

EXPERIENCE:

SIMALABS INTERNATIONAL, Merrillville, IN - December 1996 - Present
Responsibilities include all accounting functions including accounts payable, accounts receivable, general ledger, payroll and purchasing. Preparation of monthly financial statements along with budget analysis and cash management.

STRATEGIC ENERGY LTD, Pittsburgh, PA. - November 1989 - November 1994
Associate Energy Analyst responsible for research, document review, contract analysis, tariff analysis, spreadsheet design and preparation, numerical analysis and preparation of charts, graphs and report text.

MAGEE-WOMENS HOSPITAL, Pittsburgh, PA - May 1994 - August 1994
Purchasing Assistant Intern responsible for assisting three purchasing agents and the purchasing manager in placing orders, price analysis and attended weekly supplier meetings. Educated in different aspects of purchasing and how to handle pricing discrepancies.

DAVID ATTORNEY, ESQUIRE, Pittsburgh, PA - October 1987 - November 1989
Legal Assistant - maintained plaintiff and defense files from inception through completion. Drafted and answered interrogatories, requests for production and other materials necessary for discovery. Drafted pleadings, obtained medical records and prepared pretrial statements.

3.0 QUALITY ASSURANCE OBJECTIVES

3.1 Introduction

SIMALABS International's quality assurance objective is to develop, implement and maintain standard operating procedures and report data that are defensible in a court of law. It is our desire to establish goals to maintain the highest proficiency in obtaining accuracy, precision and completeness of our analyses. These goals allow customers to have total confidence that out data and reports are complete and justifiable.

3.2 Accuracy

Accuracy means the closeness of a value to a reference value. For our purpose, we will use surrogates, spikes, and preparation standards as a tool to monitor accuracy in the laboratory. See tables 3.1, 3.1.1, and 3.1.2 for acceptance limits. The applicable calculations are defined below:

* Percent Recovery of Surrogate:

$$\frac{\text{amount of surrogate found in sample}}{\text{amount of surrogate added to sample}} \quad X\ 100$$

* Percent Recovery of Preparation Standards:

$$\frac{\text{amount of standard recovered}}{\text{amount of standard added}} \quad X\ 100$$

* Percent of Recovery Spike:

$$\frac{\text{total analyte found - analyte originally found}}{\text{analyte added}} \quad X\ 100$$

3.3 Precision

Precision means the closeness of duplicates and replicates of analyses are done in the laboratory (see Table 3.1 for specified limits).

$$\text{RPD} = (C_1 - C_2) \,/\, \frac{(C_1 + C_2)}{2} \quad X\ 100$$

3.4 Completeness

All samples we receive are analyzed unless otherwise specified from the client. We expect to analyze all samples within QA/QC criteria; however, there will be times when to QA/QC cannot be met. Due to this circumstance, we will want to have a completeness of 95%.

Completeness:

$$\frac{\text{total number of approved results}}{\text{total number of samples analyzed}} \times 100$$

3.5 Comparability

Comparability means comparing one sample method to another sample method. SIMALABS International follows methods set forth by the Environmental Protection Agencies (EPA's) 600/4-79-020 and SW-846, 3rd Edition Methods. These methods can be compared to old methods and to future methods set by the agency.

3.6 Representativeness

This is based upon the degrees which on set of data represents the characteristics of the sampling points. This is not applicable to the laboratory setting.

Technique	Method	Matrix	Duplicate Control Limits (+/-)	MS/MSD % Recovery	Preparation Standard Control Limits
	200.7	Aqueous	15%	80 - 120	80 - 120
	6010	Soil/Sludge/Liquid	30%	70 - 130	70 - 130
Vapor AA	245.1/7470	Aqueous	15%	80 - 120	80 - 120
d Vapor AA	7471	Soil/Sludge/Liquid	30%	70 - 130	70 - 130
ite Furnace AA	200 Series/7000 Series	Aqueous	15%	80 - 120	80 - 120
phite Furnace AA	7000 Series	Soil/Sludge/Liquid	30%	70 - 130	70 - 130
y	305.1	Aqueous	10%	90 - 110	N/A
dity	Land & Lakes	Soil/Sludge/Liquid	30%	70 - 130	N/A
nity	310.1	Aqueous	10%	90 - 110	N/A
linity	Land & Lakes	Soil/Sludge/Liquid	30%	70 - 130	N/A
onia as N	350.2	Aqueous	20%	80 - 120	80 - 120
monia as N	350.2 M	Soil/Sludge/Liquid	30%	70 - 130	70 - 130
	160.4	Soil/Sludge/Liquid	20%	N/A	N/A
	405.1	Aqueous/Sludge	20%	N/A	N/A
de	325.3	Aqueous	10%	90 - 110	N/A
de	9252	Soil/Sludge/Liquid	30%	70 - 130	N/A
Chlorine	330.5	Aqueous	15%	85 - 115	N/A
Chlorine	~~330.5 M~~	Soil/Sludge/Liquid	30%	~~70 - 130~~	~~N/A~~
	410.1	Aqueous	20%	80 - 120	80 - 120
de, Reactive	7.3.3.2	Aqueous	N/A	N/A	N/A
nide, Reactive	7.3.3.2	Soil/Sludge/Liquid	N/A	N/A	N/A
e, Total	335.2/9010	Aqueous	15%	80 - 120	80 - 120
nide, Total	9010	Soil/Sludge/Liquid	30%	70 - 130	70 - 130
oint, closed cup	1010	Aqueous	5 deg. F	N/A	N/A
hpoint, open cup	1010	Soil/Sludge/Liquid	5 deg. F	N/A	N/A
e	340.1	Aqueous	20%	80 - 120	N/A
ride	340.1 M	Soil/Sludge/Liquid	30%	70 - 130	N/A
alent Chromium	218.4	Aqueous	10%	80 - 120	N/A
avalent Chromium	7196	Soil/Sludge/Liquid	30%	70 - 130	N/A
/Nitrite	353.3	Aqueous	20%	80 - 120	N/A
te/Nitrite	9200	Soil/Sludge/Liquid	30%	70 - 130	N/A
	354.1	Aqueous	20%	80 - 120	N/A
e	354.1 M	Soil/Sludge/Liquid	30%	70 - 130	N/A

nued)

Technique	Method	Matrix	Duplicate Control Limits (+/-)	MS/MSD % Recovery	Preparation Standard Control Limits
. Grease	413.1	Aqueous	20%	80 - 120	80 - 120
*, Grease	9071	Soil/Sludge/Liquid	40%	60 - 140	60 - 140
t Filter	9095	Soil/Sludge/Liquid	Pass/Fail	N/A	N/A
nolics	420.1/9065	Aqueous	20%	80 - 120	80 - 120
nolics	9065	Soil/Sludge/Liquid	30%	70 - 120	70 - 120
sphorus, Ortho	365.2	Aqueous	20%	80 - 120	N/A
sphorus, Ortho	365.2 M	Soil/Sludge/Liquid	30%	70 - 130	N/A
sphorus, Total	365.2	Aqueous	20%	80 - 120	80 - 120
sphorus, Total	365.2 M	Soil/Sludge/Liquid	30%	70 - 130	70 - 130
	150.1/9040	Aqueous	5%	N/A	N/A
	9045	Soil/Sludge/Liquid	10%	N/A	N/A
ls, Total	160.3	Aqueous	20%	N/A	N/A
ids, Total	160.3 M	Soil/Sludge/Liquid	20%	N/A	N/A
ls, Total Dissolved	160.1	Aqueous/Liquids	20%	N/A	N/A
ids, Total Suspended	160.2	Aqueous/Liquids	20%	N/A	N/A
ls, Total Volatile	160.4	Aqueous	20%	N/A	N/A
ids, Total Volatile	160.4	Soil/Sludge/Liquid	20%	N/A	N/A
cific Conductance	2510 B	Aqueous	10%	N/A	N/A
lfate	375.4	Aqueous	15%	85 - 115	N/A
te	9038	Soil/Sludge/Liquid	30%	70 - 130	N/A
lfide, Reactive	7.3.4.1	Aqueous	N/A	N/A	N/A
de, Reactive	7.3.4.1	Soil/Sludge/Liquid	N/A	N/A	N/A
lfide, Total	376.2/9030	Aqueous	30%	60 - 130	60 - 130
de, Total	9030	Soil/Sludge/Liquid	50%	60 - 120	50 - 120
lfite	377.1	Aqueous	20%	80 - 120	N/A
s	377.1 M	Soil/Sludge/Liquid	30%	70 - 130	N/A
N	351.3	Aqueous	20%	80 - 120	80 - 120
	351.3 M	Soil/Sludge/Liquid	40%	60 - 140	60 - 140
C	624/8240	Aqueous	N/A	**	N/A
	8240	Soil/Sludge/Liquid	N/A	**	N/A
OC	625/8270	Aqueous	N/A	**	N/A
C	8270	Soil/Sludge/Liquid	N/A	**	N/A
/Pesticides	608/8080	Aqueous	N/A	**	N/A

e summary attached Table 3.1.1

See summary attached Table 3.1.2 for organic surrogate spike control limits tinued)

Technique	Method	Matrix	Duplicate Control Limits (+/-)	MS/MSD % Recovery	Preparation Standard Control Limits
Pesticides	8080	Soil/Sludge/Liquid	N/A	**	N/A
icides	8150	Aqueous	N/A	**	N/A
icides	8150	Soil/Sludge/Liquid	N/A	**	N/A
- IR	418.1	Aqueous	20%	80 - 120	80 - 120
- IR	9071	Soil/Sludge/Liquid	40%	60 - 140	60 - 140
- GC	8015 M	Aqueous	N/A	80 - 120	N/A
- GC	8015 M	Soil/Sludge/Liquid	N/A	60 - 140	N/A
- HPLC	610/8310	Aqueous	N/A	25 - 120	N/A
- HPLC	8310	Soil/Sludge/Lic	N/A	25 - 120	N/A

summary attached Table 3.1.1

summary attached Table 3.1.2 for organic surrogate spike control limits

ganic MS/MSD Control Limits

	Aqueous % Rec. Limit	Aqueous % RPD Limit	Soil/Sludge/Liquid % Rec. Limit	Soil/Sludge/Liquid % RPD Limit
A Fraction				
-Dichloroethene	61 - 145	14	59 - 172	22
chloroethene	71 - 120	14	62 - 137	24
orobenzene	75 - 130	13	60 - 133	21
luene	76 - 125	13	59 - 139	21
izene	76 - 127	11	66 - 142	21
A Fraction				
4-Trichlorobenzene	39 - 98	28	38 - 107	23
naphthene	46 - 118	31	31 - 137	19
-Dinitrotoluene	24 - 96	38	28 - 89	47
-Butylphthalate	11 - 117	40	29 - 135	47
rene	26 - 127	31	35 - 142	36
itroso-di-n-propylamine	41 - 116	38	41 - 126	38
Dichlorobenzene	36 - 97	28	28 - 104	27
tachlorophenol	9 - 103	50	17 - 109	47
nol	12 - 89	42	26 - 90	35
Chlorophenol	27 - 123	40	25 - 102	50
hloro-3-methylphenol	23 - 97	42	26 - 103	33
Nitrophenol	10 - 80	50	11 - 114	50
ticide Fraction				
ane	56 - 123	15	46 - 127	50
ptachlor	40 - 131	20	35 - 130	31
in	40 - 120	22	34 - 132	43
eldrin	52 - 126	18	31 - 134	38
rin	56 - 121	21	42 - 139	45
-DDT	38 - 127	27	23 - 134	50
bicide Fraction				
D	40 - 120	25	30 - 130	50
,5-TP (Silvex)	40 - 120	25	30 - 130	50

Organic Surrogate Recovery Limits

	Aqueous % Recovery Limit	Soil/Sludge/Liquid % Recovery Limit
VOA Fraction		
Toluene-d8	88 - 110	81 - 117
Bromofluorobenzane	86 - 115	74 - 121
1,2-Dichloroethane-D4	76 - 114	70 - 121
SVOA Fraction		
Nitrobenzene-D5	35 - 114	23 - 120
2-Fluorobiphenyl	43 - 116	30 - 116
Terphenyl-D14	33 - 141	18 - 137
Phenol-D5	10 - 94	24 - 113
2-Fluorophenol	21 - 100	25 - 121
2,4,6-Tribromophenol	10 - 123	18 -122
Pesticide Fraction		
Tetrachloro-M-Xylene(TMX)	50-150	50-150
Decachlorobiphenyl	50-150	50-150
Herbicide Fraction		
Dicamba	50-150	50-150
PNA-HPLC Fraction		
Decafluorobiphenyl	20-140	20-140

4.0 ANALYST/TECHNICIAN TRAINING PROGRAM

4.1 Overview

In today's highly competitive environmental laboratory marketplace, SIMALABS International is incorporating procedures designed to increase and insure the quality of our services. Our product quality is directly proportional to the abilities of our personnel. The capabilities of our analysts are greatly dependent on their training. This program has been designed to ensure that all laboratory analysts are properly trained, and that ongoing verification of their abilities occurs.

4.2 Scope

The SIMALABS International training program involves accounting of previously attained skills, and tracking of skills learned in our facility. To accomplish the initial accounting portion of the program, a form (Example 4.1) has been developed to list those analyses learned in other quality oriented environmental facilities. If possible, a training record from previous employers will be obtained.

Since the background of incoming employees varies, it will be the laboratory managers responsibility to determine the extent of training required. Employees with four year science degrees will fall under our "Analyst" training procedure, while non-degree personnel will be addressed with our "Technician" training program. All records will be updated on an as-needed basis and reviewed by the staff member and laboratory manager during yearly reviews.

4.3 Analyst Training Program

Analyst training will be conducted using a multi-step process, where a checklist (Example 4.2) will be followed to ensure and verify that all necessary aspects of the process are mastered.

When a new test is assigned, the analyst will be instructed to read and understand SIMALABS International's Standard Operating Procedure (SOP). In addition, the analyst will be required to review the applicable methods referenced in the SOP, and any background information deemed significant to achieve full comprehension (e.g. Instrument manuals, EPA CLP SOW's SW-846, etc.). To verify that the proper information was derived, the analyst will conduct a verbal dry run with an experienced analyst.

Upon completion of proper literature study, the new analyst will conduct the test under the supervision of an experienced analyst. Due to the disparity of difficulty in analyses throughout the laboratory, the minimum time for supervision will be test-specific. When supervised training has been completed, the analyst will be released for individual analysis by the supervising analyst.

Verification of the analyst's ability to function self-sufficiently will be determined by analysis of a performance evaluation sample, calibration curve, detection limit study, or other equivalent measure, as prescribed by the laboratory manager.

Due to SIMALABS International stringent QA/QC protocol, and participation in various performance evaluation programs, ongoing analyst capabilities will be monitored. Additionally, it is our intention to implement "double-blind" PE samples analyses, where the Assistant Laboratory Manager and the QC Officer are the only staff members aware that the samples are performance evaluations.

4.4 Technician Training Program

SIMALABS International's intention is to utilize non-degree "Technicians" in sample preparation positions. Training for these positions will be similar to the multi-step process used for analysts. However, testing and monitoring of basic skill will be substantially more stringent. All technician training stages will be tracked utilizing a checklist (Example 4.3).

When a new sample preparation procedure is assigned, the technician will be instructed to read and understand SIMALABS International's Standard Operating Procedure (SOP). In addition, the technician will be required to review the applicable methods referenced in the SOP, and any background information deemed significant to achieve full comprehension (e.g. EPA CLP SOW's, SW-846, etc.). To verify that the proper information was derived, the technician will be verbally quizzed by an experienced analyst.

Upon completion of proper literature study, the new technician will conduct the test uder the supervision of an experienced analyst. Due to the nature of preparatory procedures throughout the the laboratory, the minimum time for supervision will be test-specific. When the minimum time for supervised training has been reached, the technician will be released for individual work by the supervising analyst.

Verification of the technician's ability to function self-sufficiently will be determined by preparation of a performance evaluation sample, calibration curve, detection limit study, or other equivalent measure, as prescribed by the laboratory manager and QC officer.

Due to the methodologies employed, ongoing verification of the technician's effectiveness occurs. All preparatory processes require sufficient QC samples (e.g. surrogates, spikes, standards, etc.). To monitor the technician's abilities with every preparation batch.

Previous Experience Records

...ne: ______________________________ Date of Hire:

...cation: ______________________________

...vious work experience:

Organization	Location	Dates	Position

...thods Learned:

Method Name	Method #'s	Experience(yrs)	Trained By

Example 4.1

Technician Training Record

'nee: ______________________ *Date Training Initiated:* ______________________

:hod: ______________________ *Trainer:* ______________________

Process	Complete Technician	Complete Date	Approved Trainer	Approved Date
d & Understand SIMALABS International SOP				
d Referenced Methods				
c Techniques Review				
ulations Review				
bal Dry Run				
erve Technique				
ervised Analysis				
ased for Independent Work				
fication of Capabilities *				
ining Report Checklist Completed				

fication Procedure Utilized:

ES: ______________________

____

____

nician: ______________________ ______________________
signature date

iner: ______________________ ______________________
signature date

Manager: ______________________ ______________________
signature date

Example 4.2

Analyst Training Record

...e: ______________________ *Date Training Initiated:* ______________________

...od: ______________________ *Trainer:* ______________________

Process	Complete Analyst	Complete Date	Approved Trainer	Approved Date
...d & Understand SIMALABS International SOP				
... Referenced Methods				
...al Dry Run				
...ve Technique				
...ervised Analysis				
...ved for Independent Work				
...fication of Capabilities *				
...g Report Checklist Completed				

...ion Procedure Utilized: ______________________

____

____

____

...t: ______________________ ______________________
signature date

...: ______________________ ______________________
signature date

...anager: ______________________ ______________________
signature date

Example 4.3

5.0 SAMPLE CUSTODY

SIMALABS International has incorporated strict procedures for sample custody. These guidelines were established to maintain the custody of samples in the laboratory, and the legal validity of results generated.

The sample custody SOP outlines the general procedures utilized in sample custody of all samples received. This is to be considered a minimum requirement. Often project specific guidelines are required which supersede these procedures. The attached SOP details sample receipt, login, storage, internal sample transfer, storage and disposal (see Section 5.1).

Table 5.1, Sample Containers and Preservation

Example 5.1, Chain of Custody

Example 5.2, Login/Internal Sample Transfer Page

Example 5.3, Parameter Request sheet

Example 5.4, Internal Sample Transfer COC sheet

Example 5.5, Cooler Inspection Form

STANDARD OPERATING PROCEDURES FOR SAMPLE CUSTODY

Introduction

This SOP is designed to outline the procedures used to initiate and maintain sample custody for samples received in the laboratory. Procedures have been instituted to insure that proper sample custody has been established upon receipt and that this custody is maintained during the entire analytical process.

Procedure

When a sample cooler is received, sample login is immediately initiated. The cooler is inspected externally to determine if any obvious leakage has occurred. It is additionally checked for any potential hazard warnings. The cooler seals are broken and the chain of custody (COC) (Example 5.1) is removed. A thermometer is placed in the cooler for a period of 15 minutes, and the receipt temperature is recorded. While the cooler temperature is being measured, the COC is reviewed and signed.

The entire contents of the cooler are removed and all samples are placed on the login counter in COC order. All bottles are inspected for problems such as breakage. VOA vials are inspected for headspace, and so noted if any head-space is present. Upon completion of inspection, the COC is checked against the sample bottles received. Any discrepancies or inadequate volumes are notified to the manager immediately.

The sample custodian will login the samples and assign a unique identification number (Example 5.2). This number will be placed on a label and affixed to each jar received for a given sample. The samples are placed in the walk-in cooler (maintained at 4°C), except VOC's which are placed in a segregated refrigerator at 4°C.

The custodian completes a parameter request sheet (Example 5.3) including client information, turnaround time, parameters requested and any pertinent comments regarding sample receipt or analytical requirements.

The internal sample transfer chain of custody (Example 5.4) is completed. Each bottle received is given a separate line on the form. The type of bottle and analyses to be conducted are noted. The sample is initially signed in by the sample custodian. When an analyst requests a sample, the custodian removes the sample container from the cooler and releases it with a signature. Upon completion of the analysis the sample is returned to the sample custodian and signed in.

When a bottle is returned empty, it is noted on the Internal Sample Transfer Chain of Custody and the bottle is disposed. All partially used samples are stored in the cooler for 30 days after the report is sent to the client. After 30 days, the samples are placed in storage for an additional 30 days. At this point, the samples are properly disposed. All storage transfers are noted on the Internal Sample Transfer COC.

ample Containers and Preservation

Parameter	Matrix	Size and Type of Container	Preservative	Temperature
als	Aqueous	500 mL plastic	HNO_3	Cool to 4 deg. C
als	Soil/Sludge/Liquid	4 oz. squat	——	Cool to 4 deg. C
ity	Aqueous	500 mL plastic	——	Cool to 4 deg. C
alinity	Aqueous	500 mL plastic	——	Cool to 4 deg. C
monia	Aqueous	1 L amber	H_2SO_4	Cool to 4 deg. C
D	Aqueous	1 L amber	——	Cool to 4 deg. C
oride	Aqueous	500 mL plastic	——	Cool to 4 deg. C
al Chlorine	Aqueous	500 mL plastic	——	Cool to 4 deg. C
D	Aqueous	500 mL plastic	H_2SO_4	Cool to 4 deg. C
al Cyanide	Aqueous	1 L amber	NaOH	Cool to 4 deg. C
oride	Aqueous	500 mL plastic	——	Cool to 4 deg. C
avalent Chromium	Aqueous	500 mL plastic	——	Cool to 4 deg. C
rate/Nitrite	Aqueous	500 mL plastic	H_2SO_4	Cool to 4 deg. C
ta	Aqueous	500 mL plastic	——	Cool to 4 deg. C
& Grease	Aqueous	1 L amber	H_2SO_4	Cool to 4 deg. C
nolics	Aqueous	1 L amber	H_2SO_4	Cool to 4 deg. C
sphorous, Ortho	Aqueous	500 mL plastic	——	Cool to 4 deg. C
osphorous, Total	Aqueous	500 mL plastic	H_2SO_4	Cool to 4 deg. C
	Aqueous	500 mL plastic	——	Cool to 4 deg. C
act.\Corros.\Ignit.	Soil/Sludge/Liquid	1 L amber	——	Cool to 4 deg. C
ds Testing	Aqueous	500 mL plastic	——	Cool to 4 deg. C
ds Testing	Soil/Sludge/Liquid	4 oz. squat	——	Cool to 4 deg. C
fate	Aqueous	500 mL plastic	——	Cool to 4 deg. C
de	Aqueous	500 mL plastic	Zn Acetate & NaOH	Cool to 4 deg. C
fite	Aqueous	500 mL plastic	——	Cool to 4 deg. C
P	Soil/Sludge/Liquid	1 L amber	——	Cool to 4 deg. C
N	Aqueous	1 L amber	H_2SO_4	Cool to 4 deg. C
	Aqueous	40 mL vial (2)	HCL	Cool to 4 deg. C
	Soil/Sludge/Liquid	4 oz. squat	——	Cool to 4 deg. C
C	Aqueous	1 L amber (2)	——	Cool to 4 deg. C
C	Soil/Sludge/Liquid	4 oz. squat	——	Cool to 4 deg. C
B/Pesticides	Aqueous	1 L amber (2)	——	Cool to 4 deg. C
/Pesticides	Soil/Sludge/Liquid	4 oz. squat	——	Cool to 4 deg. C
icides	Aqueous	1 L amber (2)	——	Cool to 4 deg. C
icides	Soil/Sludge/Liquid	4 oz. squat	——	Cool to 4 deg. C
nuclear Aromatics	Aqueous	1 L amber (2)	——	Cool to 4 deg. C
nuclear Aromatics	Soil/Sludge/Liquid	4 oz. squat	——	Cool to 4 deg. C
- GC	Aqueous	40 mL vial (2)	——	Cool to 4 deg. C
H - GC	Soil/Sludge/Liquid	4 oz. squat	——	Cool to 4 deg. C
- IR	Aqueous	1 L amber	——	Cool to 4 deg. C
- IR	Soil/Sludge/Liquid	4 oz. squat	——	Cool to 4 deg. C

[redacted] [redacted] [redacted]/.[redacted]S [redacted]n[redacted]a.[redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted]

250 West 84th Drive Merrillville, Indiana 46410
Tel: (219) 769-8378 Fax: (219) 769-1664

Number ______

lent	Project Name: / Project No.
ldress	Location:
	Turnaround Time (circle one):
lephone No.	24 Hour 48 Hour 72 Hour 3-5 Days 7-10 Days
ntact person to telephone / fax (circle one) results to:	Fax No.
rchase Order No. (or other billing reference):	
mpled by (PRINT):	Sampler Signature:

Sample #	Date	Time	Sample Description	# of Contain-ers	Matrix	ANALYSIS REQUESTED													Laboratory Identificatio

omments:	Relinquished by:	Date / Time	Received By:	Date / Time

Example

SIMALABS INTERNATIONAL LOG-IN / INTERNAL SAMPLE TRANSFER

Date Received	Date Needed	Analyses Needed	Log / Lab No.	Client I.D.	Matrix	Client	Initial	Bottle Type	Sign - Out
			971						
			971						
			971						
			971						
			971						
			971						
			971						
			971						
			971						
			971						
			971						
			971						
			971						
			971						
			971						

Example

PARAMETER REQUEST SHEET

Paperwork To -

___ QC (Data Pkg.Req'd)

___ WET CHEM

___ METALS

___ ORGANICS

___ SUBCONTRACTED

naround Time:
- Emergency (same day)
- 24 Hrs
- 48 Hrs
- ___ 72 Hrs
- ___ 3 - 5 Days
- ___ 7 - 10 Days

Date Rec'd: ______________

Lab ID(s): ______________

nt: ______________ Contact: ______________

ress: ______________ Phone No.: ______________

Fax No.: ______________

cility Name: ______________ Job / Proj. #: ______________

nple ID: ______________ P.O. #: ______________

nple Matrix: Aqueous / Soil / Sludge / Oil / Solid / Other: ______________ Received By: ______________ Co. Name: ______________

ical / Appearance / Gravimetrics
- Acid / Base / Water Compatibility
- Ash, %
- Color ***
- Density (g/cc) / Specific Gravity
- Flashpoint - CC (closed cup)
- Flashpoint - OC (open cup)
- Moisture, % (100 - %TS)****
- Odor ***
- Paint Filter Test (free liquids, P/F)
- Physical Description
- Solids, % Settleable ***
- Solids, % Total (TS) ****
- Solids, % Total Dissolved (TDS) ****
- Solids, % Total Suspended (TSS) ****
- Solids, % Total Volatile (TVS) ****
- Turbidity ***

- ___ pH *
- ___ Phosphorus, Total ***
- ___ Phosphorous (ortho-Phosphate) ***
- ___ Sulfate (SO4=)
- ___ Sulfite (SO3=) *
- ___ Total Organic Carbon (TOC)
- ___ Total Organic Halogen (TOX)
- ___ Extractable Org. Halogens (EOX)

Cyanides, Sulfides & Phenolics
- ___ Cyanides, Amenable
- ___ Cyanides, Reactive
- ___ Cyanides, Total
- ___ Cyanides, Weak Acid Diss. (WAD)
- ___ Phenols, Total
- ___ Sulfides, Reactive ****
- ___ Sulfides, Total ****

ands
- BOD - 5 Day ***
- CBOD - 5 Day ***
- Chemical Oxygen Demand (COD)
- Dissolved Oxygen (DO) *
- Winkler **

Miscellaneous
- ___ Asbestos, PLM @
- ___ Asbestos, TEM @
- ___ Bromide (Br-)
- ___ Carbamates @
- ___ Coliform, Total @ **
- ___ Coliform, Fecal @ **
- ___ E. Coli @ **
- ___ Chlorine, Residual (free) *
- ___ Chlorine, Total *
- ___ Dioxins & /or Furans @
- ___ Heating Value (BTU / lb.) @
- ___ Pour Point @
- ___ Standard Plate Count @
- ___ Sulfur
- ___ Surfactants (MBAS) @ ***
- ___ Viscosity @
- ___ Water by Karl Fischer @

eral Chemistry:
s, Nutrients, Minerals, etc.
- Acidity, as CaCO3
- Alkalinity, as CaCO3
- Chloride (Cl-)
- Fats, Oil & Grease (FOG)
- Fluoride (F-)
- Hardness, as CaCO3
- Nitrogen, Ammonia (NH3)
- Nitrogen, Nitrate (NO3-) ***
- Nitrogen, Nitrite (NO2-) ***
- Nitrogen, Nitrate + Nitrite
- Nitrogen, Total Kjeldahl (TKN)
- Nitrogen, Organic (TKN - Ammonia)

Organics
- ___ PCB's
- ___ Volatile Organics (VOCs)
- ___ BTEX
- ___ BTEX + MtBE
- ___ Semi-Volatile Organics (SVOCs) *****
- ___ PNAs *****
- ___ TTO's @@
- ___ Organo Chlorine Pesticides *****
- ___ Organo Phos / N / S Pesticides @ *****
- ___ Chlorophenoxy Acid Herbicides *****
- ___ VOA GC/MS Scan (TICs)
- ___ SVOA GC/MS Scan (TICs) *****
- ___ General HC Solvent Scan (GC-FID)
- ___ Chlorinated HC Solvent Scan
- ___ Alcohol Scan (GC-FID)
- ___ 2,3,7,8-TCDD Screen (GC/MS SIM) *****

TPH
- ___ IR
- ___ GC

TCLP
- ___ 8 RCRA
- ___ 13 PP's
- ___ Arsenic
- ___ Barium
- ___ Cadmium
- ___ Chromium
- ___ Copper
- ___ Lead
- ___ Mercury
- ___ Nickel
- ___ Selenium
- ___ Silver
- ___ Zinc
- ___ ICAP Scan
- ___ VOC
- ___ SVOC ******
- ___ Pesticides ******
- ___ Herbicides ******

Total Metals
- ___ 8 RCRA
- ___ 13 PP's
- ___ Aluminum
- ___ Antimony
- ___ Arsenic
- ___ Barium
- ___ Beryllium
- ___ Boron
- ___ Cadmium
- ___ Calcium
- ___ Chromium, total
- ___ Chromium, hexavalent (Cr+6) **
- ___ Cobalt
- ___ Copper
- ___ Hardness
- ___ Iron
- ___ Lead
- ___ Lithium
- ___ Magnesium
- ___ Manganese
- ___ Mercury
- ___ Molybdenum
- ___ Nickel
- ___ Potassium
- ___ Selenium
- ___ Silicon
- ___ Silver
- ___ Sodium
- ___ Strontium
- ___ Thallium
- ___ Tin
- ___ Vanadium
- ___ Zinc
- ___ ICAP Scan

OTHER
- ___ ______________
- ___ ______________
- ___ ______________
- ___ ______________

alyze Immediately!   *** HT </= 48-hrs!   ***** 7-days until extraction

T </= 24-hrs!   **** HT </= 7 days!   ****** 7-days from TCLP tumble until prep. extraction

Subcontracted   @@ TTO's = SVOCs, VOCs, PNAs, PCBs, Pests, 2,3,7,8-TCDD (dioxin)

mments: ______________

Cooler Inspection Form

Page ______

'ceived By: ______________________ Log-in Date: ______________________

:t: ______________________ Receipt Date/Time: ______________________

:t Project No.: ______________________ Client Contact: ______________________

'pection Information: ____

____

oler Temperature: ______________________

Custody Seals	Present / Absent
Custody Seals	Intact / Broken
Chain - of - Custody	Present / Absent
Sample Condition	Intact / Broken / Leaking

COC match samples receiv YES / NO

:epancies: ____

____

____

les in cooler:

Client Sample ID	SIMALABS International Sample ID	Remarks Sample Cond.	Client Sample ID	SIMALABS International Sample ID	Remarks Sample Cond.

Example 1.1

6.0 CALIBRATION PROCEDURE AND FREQUENCY

6.1 Introduction

All analytical calibration procedures utilized at SIMALABS International have been developed to meet or exceed the requirements specified in SW-846, 3rd edition. These procedures are strictly adhered to at all times. Any variance from these procedures will be approved only by management and QC personnel.

6.2 Acceptance Criteria

Wet Chemistry: The following criteria will be used for evaluation of initial and continuing calibration data. Sample analysis will not proceed unless these criteria are met.

6.2.1 Where applicable initial calibration curves are generated using the procedure outlined in Table 6.1. Valid curves will demonstrate a correlation coefficient between 0.995 and 1.000. Wet Chemistry calibration curves will be valid for 6 months from time of generation, or until continuing calibration results do not recover within acceptable limits. These calibration curves will consist of a minimum of four calibration standards and a blank.

6.2.2 Continuing calibration data for Wet Chemistry analyses will consist of analysis of a blank and a check standard. The blank must demonstrate no contamination above the quantitation limit, and the check standard must show a recovery of 80 - 120%. If the continuing calibration does not recover within these limits, analysis will stop and corrective action will be taken. Blanks and check standards are analyzed every 10 samples.

Metals: The following criteria will be used to evaluate initial and continuing calibration data. Sample analysis will not proceed unless these criteria are met.

6.2.3 *Graphite Furnace and Cold-vapor AA:* Initial calibration of the Graphite Furnace and Cold-vapor AA will consist of analysis of a minimum of 3 standards and a blank. This procedure must be employed immediately preceding all analyses. The correlation coefficient of the curve will fall between 0.995 and 1.000. The calibration curve will be validated by analysis of an ICV and ICB. The ICV must recover between 90 - 110%. Continuing calibration will consist of analysis of a CCV and CCB every 10 samples. The CCV recovery must fall between 90 - 110%, and the CCB must be below the quantitation limit. If the CCB and/or the CCV do not pass this criteria, analysis will cease and corrective action will be employed.

6.2.4 *Inductively Coupled Plasma:* Initial calibration of the ICP will be conducted per manufacturer's specifications. This will include analysis of a blank and standard for all elements of interest. The initial calibration will be verified by analysis of an ICV and ICB. The ICV must recover between 90 - 110%. Additionally, initial calibration of the ICP will consist of quarterly determination of interelement corrective factors and individual compounds linear ranges.

Continuing calibration of the ICP will involve analysis of a CCV and CCB every 10 samples. The CCV must recover within 90 - 110% and the CCB must demonstrate background contamination below the quantitation limit. Additionally, analysis of an Interference Check Sample (ICS) will be performed at the beginning and end of every sequence. All compounds must recover within 20% of their true value.

Organic Analysis: The following criteria will be used to evaluate initial and continuing calibration data. Sample analysis will not proceed unless these criteria are met.

6.2.5 *VOC and SVOC:* Initial calibration will consist of analysis of a tune check followed by a 5-point curve for all compounds. The curve validity will be determined by comparison of the CCC and SPCC compounds specified in SW-846. All these compounds must pass their criteria for analysis to begin. See Table 6.2 for the CCC and SPCC compounds and their acceptable limits. The criteria for the tune check is listed below:

m/z	relative abundance
50	15 to 40% of m/z 95
75	30 to 60% of m/z 95
95	Base Peak, 100% relative abundance
96	5 to 9% of m/z 95
173	Less than 2% of m/z 174
174	Greater than 50% of m/z 95
175	5 to 9% of m/z 174
176	Greater than 95% but less than 101% of 174
177	5 to 9% of m/z 176

Continuing calibration for VOA and SVOA analysis will involve analysis of a tune check followed by a mid-point standard containing all analytes of concern. The continuing calibration will be evaluated using the CCC and SPCC compounds against the limits specified in Table 6.3.

6.2.6 *PCB/Pesticides/Herbicides:* Initial calibration for Pesticides or Herbicides will consist of a 5-point calibration curve. Preceding the Pesticide curve an Endrin/DDT breakdown will be conducted. The Endrin/DDT breakdown will be acceptable if neither compound breaks down greater than 20% and the sum of both breakdowns does not exceed 30%. The 5-point curve must have all compound %RSD; ≤15%.

Continuing calibration for Pesticides or Herbicides will involve analysis of a mid-point standard containing all compounds. The % Difference of all compounds from the initial calibration must be ≤ 20%. Preceding analysis of a continuing calibration standard, an Endrin/DDT breakdown will be analyzed to meet with the criteria specified above.

Initial calibration for PCB's will utilize a minimum 3-point calibration curve for Aroclor 1260. Normal calibration will utilize Aroclor 1260 unless other Aroclor's are known to be present. All curve % RSD's will be ≤20%.

Continuing calibration for PCB's will involve analysis of a mid-point standard for Aroclor 1260 unless other Aroclor's are known to be present. The % Difference from the curve must be ≤ 15%. If upon analysis it is determined that other Aroclors are present, a continuing calibration will be analyzed for that Aroclor immediately following the sample set, within 12 hours of sample analysis time.

Initial calibration for TPH will consist of a 5-point calibration curve. The 5-point curve must have a % RSD ≤25%. TPH curves are routinely analyzed for Gasoline, Diesel #2 and Motor Oil, however curves for other fuels are analyzed where applicable.

Continuing calibration for TPH will involve analysis of a mid-point standard of the fuel of concern. The % difference from the curve must be ≤20 %.

6.2.7 *HPLC - PNA's*: Initial calibration for PNA's will consist of analysis of a 5-point curve for both UV and Fluorescence detectors. All compounds % RSD's must be ≤ 30%.

Continuing calibration for PNA's will involve analysis of a mid-point standard for both UV and Fluorescence ranges. If higher reporting limits are desired, analysis of only a UV continuing calibration will occur. All compound % differences must be ≤ 30% for analysis to proceed.

6.3 Accuracy and Traceability of Calibration Standards

Accuracy and traceability of calibration standards are handled in the following manner:

6.3.1 *Organics*

All calibration standard lots are checked against certified standards. These certified standards are accompanied by data packages certifying their accuracy. Preparation of the calibration standards are documented in the following fashion:

Standard name and lot #
Date prepared and preparation analyst
Stock standard name, supplier, lot # and concentration
Date of stock standard receipt, and expiration
Amount of stock standard used
Amount of solvent used, and solvent lot #
Final volume of mixture
Final concentration of standard

6.3.2 *Metals*

The stock standards used for preparation of the initial calibration standards are of a different lot or supplier than those used for preparation of the ICV's and CCV's.
Preparation of calibration standards and check standards are documented as follows:

Standard name and lot #
Date prepared and preparation analyst
Stock standard name, supplier, lot # and concentration
Date of stock standard receipt, and expiration
Amount of stock standard used
Amount of acid used and lot #
Final volume of mixture
Final concentration of standard

6.3.3 *Wet Chemistry*

Where possible, all calibration standards prepared or purchased are checked against certified standards to check their accuracy. Preparation of standards are documented as follows:

Standard name and lot #
Date prepared and preparation analyst
Stock standard name, supplier, lot # and concentration
Date of stock standard receipt, and expiration
Amount of stock standard used
Amount of dilution reagents used and lot #
Final volume of mixture
Final concentration of standard

libration Procedures and Frequency

Parameter	Initial Calibration	Continuing Calibration	Comments
ucting oupled Plasma	Blank, Standard, ICV, ICB	CCV of different stock, CCB every 10 samples, ICS per batch	Quarterly linear ranges Quarterly interelement checks
old Vapor AA	4 point + blank minimum	CCV of different stock, CCB every 10 samples	Initial calibration daily
raphite Furnace AA	4 point + blank minimum	CCV of different stock, CCB every 10 samples	Initial calibration daily
cidity	N/A	Blank, titrant & check	All titrations in duplicate
lkalinity	N/A	Blank, titrant & check	All titrations in duplicate
mmonia as N	4 point + blank minimum	Blank, CCV every 10 samples	New curve every 6 months
	Daily balance calibration	Blank	Check dessicant yearly balance & weights certification
OD	Winkler titration weekly	Seed, blank, standard	N/A
hloride	N/A	Blank, check standard	All titrations in duplicate
tal Chlorine	4 point + blank minimum	Blank, CCV every 10 samples	New curve every 6 months
OD	4 point + blank minimum	Blank, CCV every 10 samples	New curve every 6 months
yanide, Reactive	4 point + blank minimum	Blank, CCV every 10 samples	New curve every 6 months
yanide, Total	4 point + blank minimum	Blank, CCV every 10 samples	New curve every 6 months
shpoint, on and closed cup	Certified thermometer check	Blank, standard every 10 samples	N/A
oride	4 point + blank minimum	Blank, CCV every 10 samples	New curve every 6 months
avalent Chromium	4 point + blank minimum	Blank, CCV every 10 samples	New curve every 6 months

...libration Procedures and Frequency

Parameter	Initial Calibration	Continuing Calibration	Comments
...rate/Nitrite	4 point + blank minimum	Blank, CCV every 10 samples	New curve every 6 months
...rite	4 point + blank minimum	Blank, CCV every 10 samples	New curve every 6 months
... & Grease	Daily balance calibration	Blank, standard	
...int Filter	N/A	N/A	
...enolics	4 point + blank minimum	Blank, CCV every 10 samples	New curve every 6 months
...osphorus, Ortho	4 point + blank minimum	Blank, CCV every 10 samples	New curve every 6 months
...osphorus, Total	4 point + blank minimum	Blank, CCV every 10 samples	New curve every 6 months
...	Buffer 4.0, 7.0, 10.0 calibration	Daily buffer 7.0 check	New buffer each use
...lids, Total	Daily balance calibration	Blank	Check dessicant yearly balance & weights cert.
...olids, Total Dissolved	Daily balance calibration	Blank	Check dessicant yearly balance & weights cert.
...olids, Total Suspended	Daily balance calibration	Blank	Check dessicant yearly balance & weights cert.
...olids, Total Volatile	Daily balance calibration	Blank	Check dessicant yearly balance & weights cert.
...pecific Conductance	Cell constant determination every 6 months	Blank + .01 M KCl Standard (in duplicates)	N/A
...ulfate	4 point + blank minimum	Blank, CCV every 10 samples	New curve every 6 months
...lfide, Reactive	4 point + blank minimum	Blank, CCV every 10 samples	New curve every 6 months
...lfide, Total	4 point + blank minimum	Blank, CCV every 10 samples	New curve every 6 months
...lfite	4 point + blank minimum	Blank, CCV every 10 samples	New curve every 6 months

ibration Procedures and Frequency

Parameter	Initial Calibration	Continuing Calibration	Comments
N	4 point + blank minimum	Blank, CCV every 10 samples	New curve every 6 months
C	Tune check 5 point curve	Tune check & 50 ppb standard every 12 hour sequence	QC check standard with new standard lot
OC	Tune check 5 point curve	Tune check & 50 ppb standard every 12 hour sequence	QC check standard with new standard lot
B/Pesticides	5 point curve	Midpoint standard every 12 hour sequence	QC check standard with new standard lot
bicides	5 point curve	Midpoint standard every 12 hour sequence	QC check standard with new standard lot
l - IR	5 point curve	Midpoint standard every 10 samples	N/A
l - GC	5 point curve	Midpoint standard every 12 hour sequence	QC check standard with new standard lot
A - HPLC	5 point curve	Midpoint standard every 12 hour sequence	QC check standard with new standard lot

Table 6.2
Organic Initial Calibration
CCC \ SPCC Limits

VOA Fraction Calibration Check Compounds(CCC)
Maximum %RSD for CCC is 30 %

Vinyl Chloride
1,1-Dichloroethene
Chloroform
1,2-Dichloropropane
Toluene
Ethylbenzene

VOA Fraction System Performance Check Compounds(SPCC)
Minimum mean RF for SPCC is 0.300, 0.250 for Bromoform

Chloromethane
1,1-Dichloroethane
Bromoform
1,1,2,2-Tetrachloroethane
Chlorobenzene

SVOA Fraction Calibration Check Compounds(CCC)
Maximum %RSD for CCC is 30 %

Phenol
1,4-Dichlorobenzene
2,4-Dimethylphenol
2,4-Dichlorophenol
Hexachlorobutadiene
4-Chloro-3-Methylphenol
2,4,6-Trichlorophenol
Acenaphthene
N-Nitrosodiphenylamine
Pentachlorophenal
Fluoranthene
Di-n-Octyl Phthalate
Benzo(a)Pyrene

SVOA Fraction System Performance Check Compounds(SPCC)
Minimum mean RF for SPCC is 0.050

N-Nitroso-Di-n-Propylamine
Hexachlorocyclopentadiene
2,4-Dinitrophenol
4-Nitrophenol

Table 6.3
Organic Continuing Calibration
CCC \ SPCC Limits

VOA Fraction Calibration Check Compounds(CCC)
Maximum %RSD for CCC is 25 %

Vinyl Chloride	1,2-Dichloropropane
1,1-Dichloroethene	Toluene
Chloroform	Ethylbenzene

VOA Fraction System Performance Check Compounds(SPCC)
Minimum mean RF for SPCC is 0.300, 0.250 for Bromoform

Chloromethane	1,1,2,2-Tetrachloroethane
1,1-Dichloroethane	Chlorobenzene
Bromoform	

SVOA Fraction Calibration Check Compounds(CCC)
Maximum %RSD for CCC is 25 %

Phenol	Acenaphthene
1,4-Dichlorobenzene	N-Nitrosodiphenylamine
2,4-Dimethylphenol	Pentachlorophenal
2,4-Dichlorophenol	Fluoranthene
Hexachlorobutadiene	Di-n-Octyl Phthalate
4-Chloro-3-Methylphenol	Benzo(a)Pyrene
2,4,6-Trichlorophenol	

SVOA Fraction System Performance Check Compounds(SPCC)
Minimum mean RF for SPCC is 0.050

N-Nitroso-Di-n-Propylamine
Hexachlorocyclopentadiene
2,4-Dinitrophenol
4-Nitrophenol

8.0 DATA REDUCTION, VALIDATION AND REPORTING

8.1 Introduction

This section is dedicated to the processes employed by SIMALABS International to insure that raw results are accurately transformed into final reports. Additionally, the procedures used for data validation to insure adherence to this QAPP are discussed.

8.2 Data Reduction

8.2.1 Wet Chemistry

Data reduction for wet chemistry spectrophotometer analyses involves plotting absorbance verses concentration curves for the initial calibration data points. All concentrations reported from continuing calibrations and samples are determined by applying the first order linear regression of the curve to the required absorbances by:

$$C_I = MX + B$$

where,

C_I = concentration
M = slope of curve
X = absorbance
B = y intercept

$$C_I \times DF = C_F$$

where,

DF = dilution factor
C_F = concentration final

These calculations are achieved on a statistical calculator with linear regression capabilities.

Data reduction for non-spectrophotometric analyses involves basic weight and volume calculations and is specified in each analyses SOP.

8.2.2 Metals

8.2.2.1 Graphite Furnace and Cold-vapor AA. Data reduction for Graphite Furnace and Cold-vapor AA analyses involves plotting curves of the absorbance verses concentration from the initial calibration curves. All concentrations reported from continuing calibrations and samples are derived from the 1st order linear regression applied to the curve where:

$$C_I = MX + B$$

where,

C_I = concentration
M = slope of curve
X = absorbance
B = y intercept

$C_I \times DF = C_F$

where,

DF = dilution factor
C_F = concentration final

The instrumentation used for Graphite Furnace and Cold-vapor AA analyses incorporate computers which generate the linear regression and calculate the initial concentration. These instruments produce hard copy reports which contain the curve plots and calculated analytical results.

8.2.2.2 Inductively Coupled Plasma

Data reduction for ICP analysis involves analysis of a blank and standard for each element to be reported. Pre-determined background and interelement correction factors are applied where applicable. All calibration verifications, blanks, samples and QC analyses are calculated against the initial standard to determine concentration. These concentrations are determined using a single peak area calculation.

8.2.3 Organics

Data reduction from organic analyses occurs in two fashions. GC/MS data is computer generated and all calculations, with the exception of dilution factors, are achieved by the instrument software. GC analysis is conducted using an integrator which calculates peak area and all resulting calculations are conducted manually.

8.2.3.1 GC/MS analyses use a computer to calculate reconstruction ion area counts for target compounds and their respective internal standards. Concentrations are determined by the equation below.

$$\text{concentration (ug/L)} = \frac{A_X(I_S)(V_F)}{(A_{IS})(RF)(V_O)(V_I)} \times DF$$

where,

A_X = Area of characteristic ion for compound measured in unknown
I_S = Amount of internal standard injection (ng)
A_{IS} = Area of characteristic ion for applicable internal standard
RF = Response factor (see below)
V_O = Volume of sample used (ml) or weight used in soil samples (g)
DF = Dilution factor
V_F = Volume of final extract (ul)
V_I = Volume injected (ul)

$RF = (A_X C_{IS}/A_{IS} C_X)$

where,

A_X = Area of characteristic ion for compound measured in standard
A_{IS} = Area of characteristic ion from the specific internal standard
C_{IS} = Concentration of the specific internal standard
C_X = Concentration of the compound added to the standard

8.2.3.2 Data reduction for GC analyses is achieved by comparison of the average peak area of the calibration curve to the peak area generated from the 12-hour continuing calibration. If the continuing calibration passes all criteria, analysis is initiated. All subsequent results are compounds peak area generated in the sample to the area generated in the continuing calibration. The peak areas are generated on an integrator, and concentrations are determined using an external standard method as follows:

Concentration

$$\text{Aqueous samples} = \frac{(A_x)(A)(V_T)(D)}{(A_s)(V_i)(V_s)} \quad (\text{ug/L})$$

$$\text{Non-aqueous} = \frac{(Ax)(A)(Vt)(D)}{(As)(Vi)(W)} \quad (\text{ug/g})$$

where,

A_x = Peak area of analyte in sample
A = Amount of standard injected
A_s =Area of analyte peak in standard
V_i =Volume of extract injected (ul)
V_T =Volume of total extract (ul)
V_s =Volume of sample extracted
W =Weight of sample extracted
D =Dilution Factor

8.3 Data Validation

Data validation is a multi-step process utilized during each stage of the data acquisition and reporting process. This process was designed to insure that data produced conforms to this QAPP for both accuracy and quality control level.

When data is reported the reviewing analyst must complete and sign the batch analysis QC summary form, see 8.3.1 to 8.3.3.6. This form will list all pertinent information related to the QA/QC associated with that analysis. This form is then given, with the raw data, to a peer analyst for review. The analyst will reproduce all calculations and verify the quality control adherence to the this QAPP. The peer analyst will sign-off on the QC Summary Form. This form containing all QC results, and a list of all applicable samples will be submitted to the QA personnel for review and control charting. If the data generated is of acceptable quality it is forwarded to the reporting section for data entry. Upon completion of data entry, the final report is reviewed by the Laboratory Manager and signed.

In addition to review of all QC results, the QC personnel will be responsible for reviewing a minimum of 10% of the raw data and reproducing all applicable calculations.

The QC personnel will be responsible for maintaining control charts for each test in the laboratory. These charts will be utilized to identify trends in the analysis and to establish operational control limits in the laboratory. Additionally, the QC personnel will insure monthly that all data is filed properly and in complete form.

8.4 Data Reporting/Quality Control Documentation

SIMALABS International has three levels of data deliverables, which are designated Level I, Level II, and Level III.

8.4.1 All levels of reporting includes a cover letter from the laboratory manager specifying the analyses conducted and any pertinent non-routine sample information.

8.4.1.1 Level II and III reports will also include a detailed case narrative discussing unusual issues encountered during analysis and all quality control issues not conforming to the QAPP.

8.4.2 Level I reports will include the following for all analyses:

- Date of sample receipt
- Date of preparation
- Date of analysis
- Analyst
- Matrix
- Laboratory I.D. #
- Client I.D. #
- Analytical method and method number
- Blank data
- Concentrations determined and resulting quantitation limits

8.4.3 Level II reports will include all Level I contents plus the following for all analyses:

- Matrix Spike/Spike Duplicate summaries
- Duplicate summaries
- Surrogate summaries

8.4.4 Level III reports, which are equivalent to CLP data packages in content, will include all Level I contents plus the following:

GC/MS Analyses:

- Surrogate Summary form
- Matrix Spike Summary form
- Blank Summary form
- Tune Check Summary form
- Initial Calibration Summary form
- Continuing Calibration Summary form
- Is Area/Retention Time Summary from
- All Raw Data
- Target Spectra for positive hits with corresponding standard reference spectrum
- Preparation records

GC/HPLC Analyses:

- Surrogate Summary form
- Matrix Spike Summary form
- Blank Summary form
- Initial Calibration Summary form
- Continuing Calibration Summary form
- Retention Time Summary form
- All raw data
- Preparation records

Metals Analyses:

- ICV, CCV Summary form
- ICB, CCB, Prep Blank Summary form
- ICP Interference Check Sample Summary form
- Spike Sample Recovery form
- Duplicate Sample Summary form
- Laboratory Control Sample Summary form
- All Raw Data
- Preparation Records

Wet Chemistry:

- Calibration Curve summaries
- Calibration Check Standard summaries
- Blank summaries
- Duplicate summaries
- Spike Sample summaries
- Raw Data
- Preparation Records

MPLE 8.3.1

.tch Analysis QC Summary Form

t Chemistry

alysis Conducted: ____________________

paration Analyst: ____________________

forming Analyst: ____________________

e of Analysis: ____________________

ank Result: ____________________

ndard Result: ____________________ *Reference Curve Date:* ____________________

licate Result: ____________________ ____________________

. Sample Original Result: ____________________ *Duplicate % Difference:* ____________________

atrix Spike Result: ____________________ *Amount Spiked:* ____________________

atrix Spike Sample Orig. Result: ____________________ *MS % Recovery:* ____________________

ples Associated With This Batch (20 maximum): **Please asterisk (*) 10% calculation check**

s:

____

____

____

natures:

nalyst: ____________________ *Peer Check:* ____________________

C Review: ____________________

ion Analysis QC Summary Form
's Analysis

Matrix: NON-AQUEOUS / AQUEOUS
Analysis Date: ____________
Prep. Analyst: ____________
Acqu. Analyst: ____________

Analyst Review: ____________
Peer Review: ____________
QC Review: ____________

ICP Prep Batch # STD LOT # ICV LOT # CCV LOT #

Element	(mg/L) Prep Blank	% REC Prep Std.	% REC Duplicate	% REC Matrix Spike	CCV/CCB Checks	ICV/ICB Checks	Comments
a							
um							
um							
ium							
s							
um							
per							
esium							
anese							
m							
um							
ony							
ium							
odenum							
um							
dium							
um							
n							
n							
ium							

CVAA Prep Batch # STD. LOT # ICV/CCV LOT #

ury							

GFAA Prep Batch # STD. LOT # ICV/CCV LOT #

ic							
um							
n							
nium							
ium							
er							
ny							
enum							

voa Analysis

Organics

Check: ____________

Matrix: AQUEOUS

Prep. Analyst: ____________

Accu. Analyst: ____________

Initial Cal. Date: ____________

Continuing Cal. CCC/SPCC Check: ____________

Analyst Review: ____________

Peer Review: ____________

QC Review: ____________

Sample #	(DCA) Surrogate (78 - 114)	(TOL) Surrogate (88 - 110)	(BFB) Surrogate (86 - 115)	Analysis Date	Analysis Time	Comments
BLK						
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
MS						
SD						

Recovery Information:

Sample #:	MS % Recov.	MSD % Recov.	% RPD	% Rec. Limits	% RPD Limits
chloroethene				61 - 145	14
ethene				71 - 120	14
rizene				76 - 130	13
uene				76 - 123	13
e				76 - 127	11

...tch Analysis QC Summary Form

...ics Analysis

...atile Organics

Check: ____________

Matrix: NONAQUEOUS ____________ Analyst Review: ____________

Prep. Analyst: ____________ Peer Review: ____________

Acqu. Analyst: ____________ QC Review: ____________

Initial Cal. Date: ____________

Continuing Cal. CCC/SPCC Check: ____________

Sample #	(DCA) Surrogate (70 - 121)	(TOL) Surrogate (81 - 117)	(BFB) Surrogate (74 - 121)	Analysis Date	Analysis Time	Comments:
BLK						
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
MS						
MSD						

... Recovery Information:

...D Sample #	MS % Recov.	MSD % Recov.	% RPD	% Rec. Limits	% RPD Limits
...chloroethene				59 - 172	22
...roethene				62 - 137	24
...benzene				60 - 133	21
...ne				59 - 139	21
...ne				66 - 142	21

ics Analysis

Pesticides, TPH

Matrix: AQUEOUS

Prep. Analyst:

Acqu. Analyst:

Initial Cal. Date:

Continuing Cal. % Diff Check:

Analyst Review:

Peer Review:

QC Review:

Sample #	(TMX) Surrogate (60 - 150)	(DCB) Surrogate (60 - 150)	(TPH) Surrogate (60 - 120)	Analysis Date	Analysis Time	Comments
20						
21						

Recovery Information:

D Sample #	MS % Recov.	MSD % Recov.	% RPD	% Rec. Limits	% RPD Limits
ne				56 - 123	15
lor				40 - 131	20
				40 - 120	22
				52 - 126	18
				56 - 121	21
DDT				38 - 127	27
				50 - 150	25
				60 - 120	25

ics Analysis

Pesticides, TPH

Matrix: NON-AQUEOUS

Prep. Analyst: ______________

Accu. Analyst: ______________

Initial Cal. Date: ______________

Continuing Cal. % Diff Check: ______________

Analyst Review: ______________

Peer Review: ______________

QC Review: ______________

Sample #	(TMX) Surrogate (50 - 150)	(DCB) Surrogate (50 - 150)	(TPH) Surrogate (40 - 120)	Analysis Date	Analysis Time	Comments
1)						
2)						
7)						
9)						
4)						
6)						
3)						

e Recovery Information:

D Sample #:	MS % Recov.	MSD % Recov.	% RPD	% Rec. Limits	% RPD Limits
ane				46 - 127	50
chlor				35 - 130	31
				34 - 132	43
				31 - 134	38
				42 - 139	45
DDT				23 - 134	50
				50 - 150	40
				50 - 140	40

...atile Analysis

[illegible]: [illegible]

Analyst Review: ____

Prep. Analyst: ____

Peer Review: ____

Acqu. Analyst: ____

QC Review: ____

Initial Cal. Date: ____

Continuing Cal. CCC/SPCC Check: ____

Sample #	(NBZ) Surrogate (35 - 114)	(FBP) Surrogate (43 - 116)	(TER) Surrogate (33 - 141)	(PHE) Surrogate (10 - 94)	(FLP) Surrogate (21 - 100)	(TBP) Surrogate (10 - 123)	Analysis Date	Analysis Time	Comments:

...covery Information:

Sample #:	MS % Recov.	MSD % Recov.	% RPD	% Rec. Limits	% RPD Limits
...nzene				39 - 98	28
...thene				46 - 118	31
[illegible]				24 - 96	38
[illegible]				11 - 117	40
				26 - 127	31
[illegible]				41 - 116	38
...benz				36 - 97	28
...lorophenol				9 - 103	50
				12 - 89	42
...phenol				27 - 123	40
...o-3-methyl				23 - 97	42
...enol				10 - 80	50

7.0 ANALYTICAL METHODS

SIMALABS International follows analytical procedures taken from methods listed in the below mentioned manuals. Table 7.1 lists all methods to be employed for this project.

All analyses in the laboratory have been developed to meet with guidelines established in the referenced methods and this QAPP. No deviation from these procedures will occur without notification to and approval of the Quality Assurance Officer.

SIMALABS International has established specific SOP's for all tests analyzed in this project. These SOP's reflect exact procedures used when analyzing samples in the laboratory. These procedures are maintained by the Quality Assurance Officer and routinely updated when changes are warranted. Copies of these SOP's can be furnished upon request.

7.1 Methods:

1. Methods for Chemical Analysis of Water and Waste, EPA No. 600-79-020, March, 1979 (revised March, 1983)

2. "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods", SW-846, Third Edition, November, 1986 and any subsequent updates, supplements or amendments

3. Standard Methods for the Examination of Water and Waste Water, 17th Edition, 1989

.1 Wet Chemistry

Analyte	Aqueous Method	Soil\Sludge\ Liquid Method	Aqueous PQL* (mg/L)	Soil\Sludge Liquid PQL* (mg/Kg)	P	A
cidity	305.1	Land & Lakes	10	1.0 %		
alinity	310.1	Land & Lakes	10	1.0 %		
mmonia as N	350.2	350.2 M	0.50	50		
1	N/A	160.4	N/A	0.1 %		
OD	405.1	N/A	2.0	N/A		
oride	325.3	9252	1.0	100		
al Chlorine	330.5	330.5 M	0.05	5.0		
OD	410.1	N/A	10	N/A		
anide, Reactive	7.3.3.2	7.3.3.2	10	10		
yanide, Total	335.2/9010	9010	0.05	5.0	X	X
shpoint, Closed-cup	1010	N/A	+/- 2 deg F	N/A		
ashpoint, Open-cup	N/A	1010	N/A	+/- 2 deg F		
oride	340.1	340.1 M	0.50	50		
exavalent Chromium	218.4	7196	0.05	5.0		
ate/Nitrite	353.3	9200	0.50	50		
itrite	354.1	354.1 M	0.05	5.0		
& Grease	413.1	9071	1.0	100		
aint Filter	9095	9095	Pass/Fail	Pass/Fail		
enolics	420.1/9065	9065	0.05	5.0	X	
osphorous, Ortho	365.2	365.2 M	0.05	5.0		
sphorous, Total	365.2	365.2 M	0.50	50		
	150.1/9040	9045	+/- 0.02 S.U.	+/- 0.02 S.U.		
ds, Total	160.3	160.3 M	10	0.1 %		
lids, Total Dissolved	160.1	N/A	10	N/A		
ds, Total Suspended	160.2	N/A	10	N/A		
lids, Total Volatile	160.4	N/A	10	N/A		
cific Conductance	2510 B	N/A	10 umhos/cm	N/A		
ate	375.4	9038	10	1000		
fide, Reactive	7.3.4.1	7.3.4.1	5.0	5.0		
ide, Total	376.2/9030	9030	0.05	5.0		X
ite	377.1	377.1 M	1.0	100		
	351.3	351.3 M	0.50	50		

QL = Practical Quantitation Limit; P = Priority Pollutants, A = Appendix IX
ese limits are matrix dependent, and may not be achieveable on all samples

Metals

Analyte	Aqueous Method	Soil\Sludge Liquid Method	Aqueous PQL* (mg/L)	Soil\Sludge Liquid\PQL* (mg/Kg)	R	T	P	A
minum	200.7/6010	6010	0.20	20				
hony	200.7/6010	6010	0.20	20				X
imony	202.2/7041	7041	0.05	5.0			X	
nic	206.2/7060	7060	0.01	1.0	X		X	X
enic	200.7/6010	6010	0.20	20		X		
m	200.7/6010	6010	0.01	1.0	X	X		X
yllium	200.7/6010	6010	0.003	0.30			X	X
n	200.7/6010	6010	0.10	10				
nium	200.7/6010	6010	0.01	1.0	X	X	X	X
mium	213.2/7131	7131	0.003	0.30				
mium	200.7/6010	6010	0.01	1.0	X	X	X	X
omium	218.2/7191	7191	0.005	0.50				
t	200.7/6010	6010	0.01	1.0				X
pper	200.7/6010	6010	0.01	1.0			X	X
er	220.2/7211	7211	0.005	0.50				
t	200.7/6010	6010	0.05	5.0				
	200.7/6010	6010	0.05	5.0	X	X	X	X
d	239.2/7421	7421	0.005	0.50				
m	200.7/6010	6010	0.02	2.0				
nesium	200.7/6010	6010	0.20	20				
anese	200.7/6010	6010	0.01	1.0				
ry	7470	7471	0.001	0.10	X	X	X	X
ybdenum	200.7/6010	6010	0.01	1.0				
	200.7/6010	6010	0.01	1.0			X	X
assium	200.7/6010	6010	2.0	200				
um	270.2/7740	7740	0.01	1.0	X		X	X
enium	200.7/6010	6010	0.20	20		X		
n	200.7/6010	6010	0.20	20				
er	200.7/6010	6010	0.01	1.0	X	X	X	X
m	200.7/6010	6010	1.0	100				
[illegible]	200.7/6010	6010	0.05	5.0				
m	200.7/6010	6010	0.20	20				X
m	279.2/7841	7841	0.005	0.50			X	
	200.7/6010	6010	0.02	2.0				X
lium	200.7/6010	6010	0.01	1.0				X
	200.7/6010	6010	0.01	1.0			X	X

Practical Quantitation Limit;
limits are matrix dependent, and may not be achieveable on all samples
RCRA, T = TCLP 8 RCRA, P = Priority Pollutants, A = Appendix IX

Table 7.1 Analytical Method (cont.)

3 Organics

Analyte	Aqueous Method	Soil\Sludge\ Liquid Method	Aqueous PQL* (ug/L)	Soil\Sludge Liquid PQL* (ug/Kg)	R	T	P	A
enaphthene	625/8270	8270	10	330	X		X	X
naphthylene	625/8270	8270	10	330	X		X	X
etone	8240	8240	10	10	X			X
tophenone	8270	8270	10	330	X			X
cetylaminofluorene	8270	8270	10	330				X
rolein	8240	8240	100	100	X			X
ylonitrile	8240	8240	100	100	X			X
drin	608/8080	8080	1.0	33	X		X	X
Chloride	8240	8240	100	100				X
minobiphenyl	8270	827[illegible]	10	330	X			X
iline	8270	8270	10	330	X			X
hracene	625/8270	8270	10	330	X		X	X
amite	8270	8270	10	330				X
clor-1016	608/8080	8080	1.0	33	X		X	X
clor-1221	608/8080	8080	1.0	33	X		X	X
clor-1232	608/8080	8080	1.0	33	X		X	X
lor-1242	608/8080	8080	1.0	33	X		X	X
oclor-1248	608/8080	8080	1.0	33	X		X	X
lor-1254	608/8080	8080	1.0	33	X		X	X
clor-1260	608/8080	8080	1.0	33	X		X	X
zene	624/8240	8240	5	5	X	X	X	X
zidine	625/8270	8270	50	1600	X		X	
nzo(a)anthracene	625/8270	8270	10	330	X		X	X
zo(b)fluoranthene	625/8270	8270	10	330	X		X	X
nzo(k)fluoranthene	625/8270	8270	10	330	X		X	X
zo(ghi)perylene	625/8270	8270	10	330	X		X	X
zo(a)pyrene	625/8270	8270	10	330	X		X	X
nzoic Acid	8270	8270	50	1600	X			
zyl Alcohol	8270	8270	50	1600	X			X
ha-BHC	608/8080	8080	1.0	33	X		X	X
-BHC	608/8080	8080	1.0	33	X		X	X
-BHC	608/8080	8080	1.0	33	X		X	X
mma-BHC (Lindane)	608/8080	8080	1.0	33	X	X	X	X
-chloroethoxy)methane	625/8270	8270	20	660	X		X	X
2-chloroethyl)ether	625/8270	8270	10	330	X		X	X
-chloroisopropyl)ether	625/8270	8270	10	330	X		X	X
-ethylhexyl)phthalate	625/8270	8270	10	330	X		X	X
omodichloromethane	624/8240	8240	5	5	X		X	X
oform	624/8240	8240	5	5	X		X	X

QL = Practical Quantitation Limit

limits are matrix dependent, and may not be achieveable on all samples

CRA Hazardous Substances, T = TCLP, P = Priority Pollutants, A = Appendix IX Organics

Organics

Analyte	Aqueous Method	Soil\Sludge\ Liquid Method	Aqueous PQL* (ug/L)	Soil\Sludge Liquid PQL* (ug/Kg)	R	T	P	A
omethane	624/8240	8240	10	10	X		X	X
mochenyl Phenyl Ether	625/8270	8270	10	330	X		X	X
enzylphthalate	625/8270	8270	10	330	X		X	X
bon Disulfide	8240	8240	5	5	X			X
in Tetrachloride	624/8240	8240	5	5	X	X	X	X
rdane	608/8080	8080	10	330	X	X	X	X
lorcaniline	8270	8270	20	660	X			X
benzene	624/8240	8240	5	5	X	X	X	X
orobenzilate	8270	8270	10	330				X
borene	8240	8240	5	5				X
loro-m-cresol	625/8270	8270	20	660	X		X	X
odibromomethane	624/8240	8240	5	5	X		X	X
oroethylvinylether	624/8240	8240	10	10	X		X	
oroethane	624/8240	8240	10	10	X		X	X
oform	624/8240	8240	5	5	X	X	X	X
oromethane	624/8240	8240	10	10	X		X	X
oronaphthalene	625/8270	8270	10	330	X		X	X
orophenol	625/8270	8270	10	330	X		X	X
hlorophenyl Phenyl Ether	625/8270	8270	10	330	X		X	X
ene	625/8270	8270	10	330	X		X	X
resol	8270	8270	10	330		X		X
sol	8270	8270	10	330	X	X		X
sol	8270	8270	10	330	X	X		X
D	8150	8150	10	330	X	X		X
DD	608/8080	8080	1.0	33	X		X	X
-DDE	608/8080	8080	1.0	33	X		X	X
DT	608/8080	8080	1.0	33			X	X
e	8270	8270	10	330	X			X
enzo(a,h)anthracene	625/8270	8270	10	330	X		X	X
ofuran	8270	8270	10	330	X			X
Dibromo-3-chloropropane	8240	8240	5	5				X
romoethane	8240	8240	5	5				X
omethane	8240	8240	5	5	X			X
-butylphthalate	625/8270	8270	10	330	X		X	X
hlorobenzene	625/8270	8270	10	330	X		X	X
chlorobenzene	625/8270	8270	10	330	X		X	X
lorobenzene	625/8270	8270	10	330	X	X	X	X
chlorobenzidine	625/8270	8270	20	660	X		X	X
-1,4-Dichloro-2-butene	8240	8240	5	5	X			X

Practical Quantitation Limit
limits are matrix dependent, and may not be achieveable on all samples
RA Hazardous Substances, T = TCLP, P = Priority Pollutants, A = Appendix IX Organics

1 Organics

Analyte	Aqueous Method	Soil\Sludge\ Liquid Method	Aqueous PQL* (ug/L)	Soil\Sludge Liquid PQL* (ug/Kg)	R	T	P	A
lorodifluoromethane	8240	8240	5	5	X			X
Dichloroethane	624/8240	8240	5	5	X		X	X
Dichloroethane	624/8240	8240	5	5	X	X	X	X
1-Dichloroethylene	624/8240	8240	5	5	X	X	X	X
s-1,2-Dichloroethylene	624/8240	8240	5	5	X		X	X
loromethane	624/8240	8240	5	5	X		X	X
Dichlorophenol	625/8270	8270	10	330	X		X	X
Dichlorophenol	8270	8270	10	330				X
2-Dichloropropane	624/8240	8240	5	5	X		X	X
,3-Dichloropropene	624/8240	8240	5	5	X		X	X
-1,3-Dichloropropene	624/8240	8240	5	5	X		X	X
ldrin	608/8080	8080	1.0	33	X		X	X
ylphthalate	8270	8270	10	330	X			X
O-Diethyl-O-2-pyrazinyl								
phorothioate	8270	8270	10	330				X
methoate	8270	8270	10	330				X
Dimethylaminobenzene	8270	8270	10	330	X			X
Dimethylbenz(a)anthracene	8270	8270	10	330	X			X
3'-Dimethylbenzidine	8270	8270	10	330				X
, alpha-Dimethyl-								
ethylamine	8270	8270	10	330	X			X
Dimethylphenol	625/8270	8270	10	330	X		X	X
thylphthalate	625/8270	8270	10	330	X		X	X
Dinitrobenzene	8270	8270	10	330				X
initro-o-cresol	625/8270	8270	50	1600	X		X	X
-Dinitrophenol	625/8270	8270	50	1600	X		X	X
Dinitrotoluene	8270	8270	10	330	X	X		X
initrotoluene	625/8270	8270	10	330	X		X	X
n-octylphthalate	625/8270	8270	10	330	X		X	X
ioxane	8240	8240	150	150				X
henylamine	8270	8270	10	330	X			X
iphenylhydrazine	8270	8270	10	330	X			
ropylnitrosamine	625/8270	8270	10	330	X		X	X
ulfoton	8270	8270	10	330				X
sulfan I	608/8080	8080	1.0	33	X		X	X
osulfan II	608/8080	8080	1.0	33	X		X	X
sulfan Sulfate	608/8080	8080	1.0	33	X		X	X
n	608/8080	8080	1.0	33	X	X	X	X
drin Aldehyde	608/8080	8080	1.0	33	X		X	X

= Practical Quantitation Limit
e limits are matrix dependent, and may not be achieveable on all samples
RCRA Hazardous Substances, T = TCLP, P = Priority Pollutants, A = Appendix IX Organics

Organics

Analyte	Aqueous Method	Soil\Sludge\ Liquid Method	Aqueous PQL* (ug/L)	Soil\Sludge Liquid PQL* (ug/Kg)	R	T	P	A
l Benzene	624/8240	8240	5	5	X		X	X
hyl Methacrylate	8240	8240	5	5	X			X
l Methanesulfonate	8270	8270	10	330				X
mphur	8270	8270	10	330				X
ranthene	625/8270	8270	10	330	X		X	X
rene	625/8270	8270	10	330	X		X	X
ntachlor	608/8080	8080	1.0	33	X	X	X	X
achlor Epoxide	608/8080	8080	1.0	33	X	X	X	X
xachlorobenzene	625/8270	8270	10	330	X	X	X	X
achlorobutadiene	625/8270	8270	10	330	X	X	X	X
achlorocyclopentadiene	625/8270	8270	10	330	X		X	X
xachloroethane	625/8270	8270	10	330	X	X	X	X
chlorophene	8270	8270	10	330				X
xachloropropene	8270	8270	10	330				X
xanone	8240	8240	10	10	X			X
no(1,2,3-cd)pyrene	625/8270	8270	10	330	X		X	X
lomethane	8240	8240	50	50	X			X
utyl Alcohol	8240	8240	50	50				X
drin	8270	8270	10	330				X
horone	625/8270	8270	10	330	X		X	X
afrole	8270	8270	10	330				X
pone	8270	8270	10	330				X
acrylonitrile	8240	8240	5	5				X
thapyrilene	8270	8270	10	330				X
oxychlor	8080	8080	1.0	33	X	X		X
thylcholanthrene	8270	8270	10	330				X
thyl Ethyl Ketone	8240	8240	10	10	X	X		X
yl Methacrylate	8240	8240	5	5				X
thyl Methanesulfonate	8270	8270	10	330				X
thylnaphthalene	8270	8270	10	330	X			X
yl Parathion	8270	8270	10	330				X
lethyl-2-pentanone	8240	8240	10	10	X			X
thalene	625/8270	8270	10	330	X		X	X
-Naphthoquinone	8270	8270	10	330				X
hthylamine	8270	8270	10	330				X
phthylamine	8270	8270	10	330				X
troaniline	8270	8270	50	1600	X			X
aniline	8270	8270	50	1600	X			X
troaniline	8270	8270	50	1600	X			X

Practical Quantitation Limit
imits are matrix dependent, and may not be achievable on all samples
RCRA Hazardous Substances, T = TCLP, P = Priority Pollutants, A = Appendix IX Organics

Organics

Analyte	Aqueous Method	Soil\Sludge\ Liquid Method	Aqueous PQL* (ug/L)	Soil\Sludge Liquid PQL* (ug/Kg)	R	T	P	A
benzene	625/8270	8270	10	330	X	X	X	X
itrophenol	625/8270	8270	10	330	X		X	X
rophenol	625/8270	8270	50	1600	X		X	X
Nitroquinoline-1-oxide	8270	8270	10	330				X
trosodi-n-butylamine	8270	8270	10	330				X
trosodiethylamine	8270	8270	10	330	X			X
itrosodimethylamine	625/8270	8270	10	330	X		X	X
trosodiphenylamine	625/8270	8270	10	330	X		X	X
Nitrosomethylethylamine	8270	8270	10	330				X
trosomorpholine	8270	8270	10	330				X
trosopiperidine	8270	8270	10	330	X			X
itrosopyrrolidine	8270	8270	10	330				X
ro-o-toluidine	8270	8270	10	330				X
rathion	8270	8270	10	330				X
achlorobenzene	8270	8270	10	330	X			X
achloroethane	8240	8240	5	5				X
tachloronitrobenzene	8270	8270	10	330	X			X
achlorophenol	625/8270	8270	10	330	X	X	X	X
enacetin	8270	8270	10	330	X			X
anthrene	625/8270	8270	10	330	X		X	X
ol	625/8270	8270	10	330	X		X	X
enylenediamine	8270	8270	10	330				X
ate	8270	8270	10	330				X
icoline	8270	8270	10	330	X			X
amide	8270	8270	10	330	X			X
ne	625/8270	8270	10	330	X		X	X
ine	8270	8270	10	330		X		X
le	8270	8270	10	330				X
rene	8240	8240	5	5	X			X
5-Tetrachlorobenzene	8270	8270	10	330	X			X
2-Tetrachloroethane	8240	8240	5	5				X
2-Tetrachloroethane	624/8240	8240	5	5	X		X	X
chloroethylene	624/8240	8240	5	5	X	X	X	X
4,6-Tetrachlorophenol	8270	8270	10	330	X			X
thyldithiopyrophosphate	8270	8270	10	330				X
ne	624/8240	8240	5	5	X		X	X
nediamine	8270	8270	50	1600	X			
idene	8270	8270	10	330				X
aphene	608/8080	8080	10	330	X	X	X	X

Practical Quantitation Limit
imits are matrix dependent, and may not be achieveable on all samples
RCRA Hazardous Substances, T = TCLP, P = Priority Pollutants, A = Appendix IX Organics

3 Organics

Analyte	Aqueous Method	Soil\Sludge\ Liquid Method	Aqueous PQL* (ug/L)	Soil\Sludge Liquid PQL* (ug/Kg)	R	T	P	A
5-TP (Silvex)	8150	8150	10	330	X	X		X
4-Trichlorobenzene	625/8270	8270	10	330	X		X	X
1-Trichloroethane	624/8240	8240	5	5	X		X	X
1,2-Trichloroethane	624/8240	8240	5	5	X		X	X
hloroethylene	624/8240	8240	5	5	X		X	X
hlorofluoromethane	624/8240	8240	5	5	X		X	X
5-Trichlorophenol	8270	8270	10	330	X	X		X
3-Trichlorophenol	625/8270	8270	10	330	X	X	X	X
2,3-Trichloropropane	8240	8240	5	5	X			X
O-triethylphosphorothioate	8270	8270	10	330				X
-Trinitrobenzene	8270	8270	10	330				X
l Acetate	8240	8240	5	5	X			X
l Chloride	624/8240	8240	10	10	X	X	X	X
tal Xylenes	8240	8240	5	5	X			X

, = Practical Quantitation Limit;
e limits are matrix dependent, and may not be achieveable on all samples
= RCRA Hazardous Substances, T = TCLP, P = Priority Pollutants, A = Appendix IX Organics

...atile Analysis

Prep. Analyst: ______________________ Peer Review: ______________________

Acqu. Analyst: ______________________ QC Review: ______________________

Initial Cal. Date: ______________________

Continuing Cal. CCC/SPCC Check: ______________________

Sample #	(NBZ) Surrogate (23 - 120)	(FBP) Surrogate (30 - 116)	(TPH) Surrogate (18 - 137)	(PHE) Surrogate (24 - 113)	(FLP) Surrogate (25 - 121)	(TBP) Surrogate (19 - 122)	Analysis Date	Analysis Time	Comments:

...ecovery Information:
...D Sample #:

	MS % Recov.	MSD % Recov.	% RPD	% Rec. Limits	% RPD Limits
...chlorobenzene				38 - 107	23
...thene				31 - 137	19
...otoluene				28 - 89	47
...phthalate				39 - 135	47
				35 - 142	38
...propylamine				41 - 126	38
...benzene				28 - 104	27
...rophenol				17 - 109	47
...				26 - 90	35
...phenol				25 - 102	50
...o-3-methylphenol				26 - 103	33
...enol				11 - 114	50

9.0 INTERNAL QUALITY CONTROL

9.1 Quality Control Procedures

The Quality Assurance program at SIMALABS International includes, at a minimum, utilization of five main quality control points to insure integrity of sample data. These quality control procedures include analysis of method blanks, duplicate samples, matrix spikes, control samples, reference standards and surrogate spikes.

9.1.1 Method Blanks (all analyses)

Method blanks are prepared with each batch of samples where 1 batch equals a maximum of 20 samples. The purpose of preparing method blanks is to detect possible contamination in the preparation or analysis of samples. The method blank consists of reagent water which is prepared and analyzed concurrently with the samples in the specific batch. If contamination is detected, the analysis is halted and the problem is rectified.

9.1.2 Duplicate Analyses (MS/MSD)

Duplicate analyses are performed on a randomly selected sample in each preparation batch (maximum 20 samples).

If duplicate results do not fall into specified compliance ranges, the entire batch is rejected, unless investigation determines that the difference is related to matrix interference or matrix inconsistency. Duplicate analyses are evaluated as follows:

$$\text{Duplicate Percent Difference} = \frac{A - B}{C}(100)$$

where,

$$C = \frac{A + B}{2}$$

and,

A	=	First sample result
B	=	Second sample result
C	=	Average of first and second results

9.1.3 Matrix Spikes (all samples)

Matrix spikes are performed on a randomly selected sample within a batch, where a batch set does not exceed 20 samples. Matrix spikes are samples fortified with a known quantity of reagent grade analyte prior to sample preparation. Matrix spike analyses are conducted to reveal possible matrix effects on sample results, such as interference or suppression. Matrix spikes are evaluated as follows:

$$\text{Percent recovery} = \frac{A - B}{C} \times 100$$

where,

A	=	concentration of spiked sample
B	=	concentration of unspiked sample
C	=	concentration of spike added

Matrix spike recoveries falling outside our statistically based acceptance criteria will result in rejection of the analytical data or other corrective action as applicable.

9.1.4 Matrix Spike Duplicates (all analyses)

Matrix spike duplicates are performed on the same sample as matrix spikes. The frequency of analysis is one per batch of 20 or fewer samples. The percent recoveries for matrix spike duplicates are calculated as above (see equation, section 9.1.3) for each analyte. Additionally, the Relative Percent Differences (RPD) between the matrix spike and matrix spike duplicate is calculated and used to assess analytical precision. RPD is calculated as follows:

$$RPD = \frac{C_1 - C_2}{1/2\,(C_1 + C_2)} \quad X \quad 100\%$$

where,

C_1 = result of the matrix spike
C_2 = result of the matrix spike duplication

9.1.5 Surrogate spikes (Organic compounds)

Surrogate compounds are spiked into organic samples to monitor preparation procedures used. Recoveries are calculated using:

$$\% \text{ Recovery} = \frac{C_1}{C_A} \quad X \quad 100$$

where,

C_1 = concentration recovered
C_A = concentration of analyte added

9.1.6 Reference Standards

Reference standards are standards of a different source than our running standards. These reference standards will be analyzed when a new lot of running standard is used. Use of these standards will reveal problems in our primary stock standards and preparation of running standard.

9.1.7 Control Samples (All analyses)

Control samples consist of deionized water spiked with known concentrations of the analytes of concern. Control sample results are used to evaluate the quality of preparation procedures, and to monitor the analysis process.

9.1.8 Field/Trip Blanks (All analyses)

Field and trip blanks may be provided by the sampling entity. These blanks are treated in the same fashion as field samples. Analysis of these blanks is used to identify possible contamination occurring in field sampling activities. Detected contamination will be reported to the client, for determination o corrective action.

9.1.9 Field Duplicates (All analyses)

Field duplicates may be provided by the sampling entity. These duplicates are analyzed in the same fashion as field samples. Analysis of these duplicates is used to assess analytical precision, and representativeness of field sampling activities.

9.1.10 Analytical Spikes (Graphite Furnace analyses)

Analytical spikes are post-digestion spikes conducted on samples. These spikes are utilized when interferences are indicated by bad sample exposure RSD's. Analytical spike results are used to determine whether dilution or Method of Standard Additions(MSA) are required.

9.1.11 Internal Standard Areas (GC/MS analyses)

Internal area responses are monitored for GC/MS analyses to insure consistent response of the analytical system. Internal standard areas will be evaluated against -50% to +100% of the corresponding continuing calibration internal standard area.

9.1.12 Mass Tuning (GC/MS analyses)

Mass tuning is verified using 4-Bromofluorobenzene for volatiles, and Decafluorotriphenylphosphine(DFTPP) and will occur at the beginning of every 12 hour sequence. These tune checks are analyzed to ensure the representativeness and reproducibility of all mass spectra generated. The specific acceptance criteria are stated in the individual SOP's.

9.1.13 Endrin/DDT Degradation Checks (Pesticide analysis)

Breakdown of Endrin and DDT are assessed prior to analysis of pesticide constituents. The breakdown is measured by calculating the concentration of DDD, DDE, Endrin Aldehyde, Endrin Ketone, and the originally introduced Endrin and DDT.

9.1.14 Second Column Confirmation (GC/ECD analysis)

A second column of dissimilar polarity is used to confirm the identity of PCB's or pesticides detected in the primary column.

10.0 PERFORMANCE AND SYSTEM AUDITS

10.1 Introduction

Performance and system audits are the responsibility of Quality Assurance personnel. Performance audits are conducted quarterly, and system audits are conducted annually. These audits are designed to assess the quality of the total laboratory operation and to assure adherence to the quality control procedures specified in this QAPP.

10.2 Performance Audits

10.2.1 A performance audit is a quarterly check by Quality Assurance personnel of the major analyses conducted in the laboratory. This audit consists of, but is not limited to:

- A blind check sample for each department.
- Determination that proper quality control and corrective action procedures were employed in analysis of the blind sample.
- Oversight of all analysts performing their major job function.
- Insure proper technique
- Adherence to the SIMALABS International operational SOP

A report of deficiencies determined in the performance audit will be submitted to laboratory management and immediate corrective action procedures will be adopted.

10.3 System Audits

System audits are annual checks performed by quality assurance personnel of the entire laboratory operation. This audit consists of cradle to grave tracking of randomly selected samples through the entire analysis process. The audit contents will consist of, but not be limited to:

- Sample receipt practices, chain of custody
- Analysis
- Adherence to SOP
- Proper quality control
- Proper corrective-action documentation
- Records keeping and data storage
- Instrument prevention maintenance
- Review of final report

10.3.1 Deficiencies determined in the system audit will be reported management and immediate corrective action procedures will be implemented.

REVENTATIVE MAINTENANCE

e 11.0

order to assure high quality analytical results, SIMALABS International has employed specific and detailed schedules of ventative maintenance on all equipment. The following schedule details the work to be performed:

Instrument	Serial No.	Each Use	As Needed	Quarterly	Annually
	2061166	Clean Align lamp Align burner	Dust & clean Clean optics	Disassemble nebulizer and clean	Check gaskets and O-rings
phite Furnace	2041012	Clean Align lamp Align burner	Dust & clean Clean optics	Disassemble nebulizer and clean	Check gaskets and O-rings
o	1338	Clean auto sampler parts	Clean nebulizer background readjust	Dust & clean interior, lubricate auto sampler	Maintain chiller
A GC/MS	3115A34915 3114A02148	Column maintenance	Clean source	Change pump oil	N/A
ge & Trap	91133001 91108017	Clean purge vessels	Replace trap	Leak check	Replace worn tubing
/OA GC/MS	3223A43647 3222A03781	Column Maintenance	Clean source	Change pump oil	N/A
rared Spectometer	64192	Clean cell	Replace lamp	N/A	N/A
C	54IN2052904 250N2033101 143437 35607 2145 CC3910573	Purge system flush injector	Replace UV and fluorescent lamps replace column	N/A	Lubricate + replace seals
FID/ECD	3115A35056	Column maintenance	Replace column	Clean ECD, FID	ECD wipe test
ec 20	3323056019	Clean cuvetts	Replace lamps	N/A	N/A
hat FIA	A83000-466	Clean pump Clean autosampler	Change o-rings, pump tubing	Lubricate, pump rollers, autosampler	Clean all surfaces
Meter 1	C0004246	Calibrate meter daily	Check, clean & repack electrode	N/A	N/A
Meter 2	C0013105	Calibrate meter daily	Check, clean & repack electrode	N/A	N/A

Instrument	Serial No.	Each Use	As Needed	Quarterly	Annually
nductivity meter	24020015	Calibrate standard with KCl	Clean electrode	N/A	N/A
ading Balance	K14382	Clean after each use	Calibrate daily	N/A	External calibration by service engineer
n Balance 1	0066806	Clean after each use	Calibrate daily	N/A	External calibration by service engineer
Balance 2	BO-40564	each use	Calibrate daily	N/A	
Balance 3	L-58817	Clean after each use	Calibrate daily	N/A	External calibration by service engineer
sher Oven 104 deg. C	30400156	Check temperature	Record temperature daily	N/A	Oil motor if applicable
ter Oven 180 deg. C	0191-0190	Check temperature	Record temperature daily	N/A	Oil motor if applicable
k-in cooler	938184	Check temperature	Record temperature daily	N/A	N/A
water	N/A	Check specific conductance	Record Specific Conductance daily	Replace resin bed & filters as necessary	N/A

12.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY AND COMPLETENESS

12.1 Assessment of Accuracy

12.1.1 Accuracy will be evaluated by comparing the mean recovery of surrogate compounds or spiked analytes against the goals identified in Section 3.0 of this manual. The recovery of a surrogate compound will be defined as:

$$\% \text{ Recovery} = \frac{\text{amount of surrogate found in sample}}{\text{amount of surrogate added to sample}} \times 100\%$$

12.1.2 The recovery of a spiked analyte will be defined as:

$$\% \text{ Recovery} = \frac{\text{total analyte found - analyte originally present}}{\text{Analyte Added}} \times 100\%$$

12.2 Calculation of Mean Values and Estimates of Precision

12.2.1 The mean value, C, of a series of replicate measurements of concentration C_i, is calculated as:

$$C = \frac{\sum_{i=1}^{N} C_i,}{N}$$

where,

N = number of replicate measurements

C and C_i are both in mg/L or mg/Kg

12.2.2 The estimate of precision of duplicate measurements is expressed the relative percent difference (RPD), where

$$RPD = \frac{C_2 - C_1}{C} \times 100\%$$

The relative percent difference will be compared with the respective goals identified in Section 3.0 of this QAPP.

12.2.3 The estimate of precision of a series of replicate measurements (primarily used in GC/MS analyses) is expressed as the relative standard deviation (RSD), where

$$SD = \sqrt{\frac{\sum_{i=1}^{N} (C - C_i)^2}{N - 1}}$$

and

$$RSD = \frac{SD}{C} \quad X \quad 100\%$$

where,

C = mean concentration as calculated in 12.2.1
C_i = replicate concentration
N = number of replicate measurements

12.3 Completeness

Completeness will be evaluated by comparing the number of samples acquired for analysis with the number of samples analyzed, as follows:

Degree of completeness =

$$\frac{\text{Total number of samples for which acceptable analytical data are generated}}{\text{Total number of samples acquired for analysis}} \quad X \quad 100\%$$

Completeness should always be 100% unless dictated by client.

13.0 CORRECTIVE ACTION

13.1 Introduction

Corrective action procedures (CAP's) are employed when blanks, duplicates, spikes, surrogates or other quality control measures are outside the limits established in this QAPP. It is the responsibility of the analyst to initiate CAP's. It is the responsibility of the QC Officer to implement CAP's. It is the responsibility of the analyst and the QC Officer to develop CAP's. It is the responsibility of the QC Officer and the Assistant Laboratory Manager to approve CAP's.

13.2 Blanks

All analytical methods utilized in the laboratory, incorporate blanks to check for contamination. If a blank demonstrates contamination higher than the quantitation limit for any analyte, analysis will be terminated and the source of the contamination will be determined. Analysis will proceed only when the contamination has been eliminated.

13.3 Duplicates

Duplicate analysis must fall within the % Difference limits established in Section 3.1 of this QAPP. If duplicates do not fall within these limits, re-analysis or other measures are employed to determine if the cause is matrix interference. If matrix interference is determined, analysis may proceed. If no evidence of matrix problems exists, then analysis is terminated and the samples are re-prepared and re-analyzed.

13.4 Matrix Spikes/Matrix Spike Duplicates

Matrix Spike recoveries must fall within the limits established in Section 3.1 of this QAPP. If Matrix Spike recoveries are not within these limits, re-analysis or other measures are employed to determine if the cause is matrix interference. If matrix interference is determined, analysis may proceed. If no evidence of matrix problems exists, then analysis is terminated and the samples are re-prepared and re-analyzed.

13.5 Surrogates

Surrogate recoveries must fall within the limits established in Section 3.1 of this QAPP. If surrogates are out, re-analysis is required. If re-analysis indicates that matrix interference exists, analysis may proceed. If re-analysis indicates that no matrix effects are present, the sample must be re-prepared. If surrogate recoveries are out-of-control in blank samples, analysis will terminate and all samples associated with that blank will be re-prepared.

13.6 Exceptions/Documentation

All corrective actions will be documented on a situation-out-of-control form (Example 13.6.1). Any exceptions to the above procedures due to matrix or amount of sample will be specified on this form. Procedures different than those stated above will be used only with the approval of quality assurance personnel.

SIMALABS International
SITUATION-OUT-OF-CONTROL FORM

e: ____________ Analyte: ____________

IMALABS International ID#: ____________

oblem: ____________

____

____

____

____

fication by: ____________ Date: ____________

otification to: ____________ Date: ____________

olution: ____________

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eventative Action: ____________

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olution / Prevention by: ____________ Date: ____________

oproved / Issue closed by: ____________ Date: ____________

14.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

14.1 Section 8.3 establishes the procedures to be utilized in validation of data generated under this QAPP. Quality assurance personnel will be responsible for compiling data and presenting quarterly reports to management.

14.2 Quarterly reports will consist of a presentation of all control charted data generated. This will include, where applicable, duplicates, spikes and surrogates recoveries. Additionally, a report will be generated which lists all situation-out-of-control issues.

14.3 Quality assurance personnel will issue reports to management when audits are conducted. All findings and recommended corrective-action procedures will be specified.

14.4 As specified in this QAPP, blind samples will be submitted to the laboratory personnel. Quality Assurance personnel will be responsible for evaluating the results generated and presenting a report to management on the laboratory's success. This same practice will be employed for evaluation of WP/WS performance evaluation results.

Appendix A

John Sima
American Analytical Inc (A2I)
150 West 84th Dr
Merrillville, IN 46410

nce Evaluation Report
Water Pollution Study WP035

Participant ID: IN00054 Type: OTHER Requesting Office: WI

Sample Number	Reported Value	True Value*	Acceptance Limits	Warning Limits	Performance Evaluation
TRACE METALS IN MICROGRAMS/LITER					
-ALUMINUM					
01	328	321	261- 382	276- 367	Accept.
02	1520	1500	1270- 1700	1330- 1640	Accept.
-ARSENIC					
01	198	193	167- 231	175- 223	Accept.
02	579	571	492- 676	515- 653	Accept.
-BERYLLIUM					
01	176	190	165- 209	170- 204	Accept.
02	536	541	480- 597	495- 583	Accept.
-CADMIUM					
01	51.0	52.6	44.5- 60.7	46.5- 58.7	Accept.
02	399	401	345- 454	359- 440	Accept.
-COBALT					
01	<10.0	28.1	22.9- 32.6	24.1- 31.4	Not Accept.
02	750	624	557- 686	574- 670	Not Accept.
-CHROMIUM					
01	17.4	17.0	13- 20.5	13.9- 19.5	Accept.
02	913	880	767- 985	794- 958	Accept.
-COPPER					
01	86.0	86.7	75.5- 96.9	78.2- 94.2	Accept.
02	373	370	334- 409	344- 399	Accept.
-IRON					
01	37.0	30.4	18.8- 41.6	21.9- 39.6	Accept.
02	481	454	441- 519	451- 509	Accept.
-MERCURY					
01	3.21	3.10	2.03- 4.07	2.29- 3.81	Accept.
02	11.3	11.6	8.65- 14.7	9.41- 13.9	Accept.
-MANGANESE					
01	402	401	369- 441	378- 432	Accept.
02	892	881	833- 968	850- 951	Accept.
-NICKEL					
01	495	496	453- 560	466- 547	Accept.
02	620	611	557- 698	574- 680	Accept.
-LEAD					
01	344	297	259- 334	269- 325	Not Accept.
02	427	399	356- 446	367- 435	Accept.
-SELENIUM					
01	470	522	402- 615	429- 588	Accept.
02	869	978	754- 1150	804- 1100	Accept.
-VANADIUM					
01	212	211	186- 234	192- 229	Accept.
02	827	811	724- 888	745- 867	Accept.
-ZINC					
01	77.0	71.9	62.7- 84.9	65.5- 82.2	Accept.
02	1900	1800	1610- 2030	1660- 1980	Accept.

Performance Evaluation Report
USEPA Water Pollution Study WP035

icipant ID: IN00054 Type: OTHER Requesting Office: WI

Sample Number	Reported Value	True Value*	Acceptance Limits	Warning Limits	Performance Evaluation
ANTIMONY					
C3	282	370	240- 450	266- 423	Accept.
C4	613	570	369- 692	410- 651	Accept.
SILVER					
C3	190	180	153- 207	160- 200	Accept.
C4	370	340	298- 391	310- 380	Accept.
THALLIUM					
C3	85.2	83.3	63.4- 99.1	67.9- 94.6	Accept.
C4	360	365	301- 425	317- 410	Accept.
MOLYBDENUM					
C3	127	130	106- 151	112- 146	Accept.
C4	346	310	257- 358	270- 345	Ck. for Err.
STRONTIUM					
C3	3.60	3.55	2.56- 4.49	2.81- 4.23	Accept.
C4	92.7	96.0	79.8- 110	83.9- 106	Accept.
TITANIUM					
C3	124	115	96.8- 130	101- 126	Accept.
C4	284	270	230- 302	239- 293	Accept.
MINERALS IN MILLIGRAMS/LITER (EXCEPT AS NOTED)					
PH-UNITS					
C3	4.34	4.30	4.22- 4.4	4.25- 4.38	Accept.
C4	5.54	5.50	5.46- 5.62	5.48- 5.6	Accept.
SPEC. COND. (UMHOS/CM AT 25 C)					
C1	892	916	830- 993	849- 964	Accept.
C2	575	586	536- 627	547- 616	Accept.
TDS AT 180 C					
C1	485	553	326- 762	380- 708	Accept.
C2	299	311	226- 398	243- 377	Accept.
TOTAL HARDNESS (AS CACO3)					
C1	364	330	302- 358	309- 351	Not Accept.
C2	114	101	90.8- 110	93.2- 108	Not Accept.
CALCIUM					
C1	114	104	92.8- 120	96.2- 116	Accept.
C2	7.12	6.39	5.53- 7.54	5.79- 7.29	Accept.
MAGNESIUM					
C1	19.4	17.0	15.2- 19.3	15.7- 18.7	Not Accept.
C2	23.5	20.6	18- 23.6	18.7- 22.9	Ck. for Err.
SODIUM					
C1	15.0	14.2	13.1- 16.2	13.5- 15.8	Accept.
C2	52.6	54.3	49.3- 58.9	50.5- 57.7	Accept.
POTASSIUM					
C1	21.8	21.0	18.8- 23.7	19.4- 23.1	Accept.
C2	38.3	38.3	33.3- 41.7	34.3- 40.7	Accept.
CHLORIDE					
C1	246	241	224- 259	228- 254	Accept.
C2	75.0	72.7	65.1- 79.8	67- 77.9	Accept.

Performance Evaluation Report
USEPA Water Pollution Study WP035

Date: 16APR96

icipant ID: IN00054 Type: OTHER Requesting Office: WI

Sample Number	Reported Value	True Value*	Acceptance Limits	Warning Limits	Performance Evaluation
LUORIDE					
01	3.59	3.50	3.09- 3.8	3.18- 3.71	Accept.
02	1.43	1.35	1.16- 1.53	1.21- 1.48	Accept.
ULFATE					
01	15.6	18.0	13.8- 22.1	14.8- 21.1	Accept.
02	39.6	86.4	72- 97	75.1- 93.9	Not Accept.
UTRIENTS IN MILLIGRAMS/LITER					
MMONIA-NITROGEN					
01	4.70	19.0	15- 22.3	15.9- 21.5	Not Accept.
02	1.81	1.40	1.15- 2.08	1.26- 1.97	Accept.
ITRATE-NITROGEN					
01	11.2	8.31	6.76- 9.69	7.11- 9.34	Not Accept.
02	0.638	0.390	0.28-0.495	0.305-0.469	Not Accept.
RTHOPHOSPHATE					
01	0.049	.0560	0.0333-0.076	0.0384-0.071	Accept.
02	2.78	2.80	2.43- 3.19	2.52- 3.1	Accept.
JELDAHL-NITROGEN					
03	0.860	0.540	0.115- 1.12	0.235-0.995	Accept.
04	9.26	7.80	5.73- 9.64	6.2- 9.17	Ck. for Err.
OTAL PHOSPHORUS					
03	0.537	0.574	0.47-0.705	0.498-0.677	Accept.
04	5.50	6.08	5.16- 7.2	5.41- 6.96	Accept.
DEMANDS IN MILLIGRAMS/LITER					
OD					
01	240	236	189- 259	198- 250	Accept.
02	94.7	101	71.2- 120	77.3- 114	Accept.
-DAY BOD					
01	107	141	64.1- 218	83.3- 199	Accept.
02	51.7	62.5	29.5- 95.5	37.7- 87.3	Accept.
ARBONACEOUS BOD					
01	103	117	34.3- 199	55.6- 178	Accept.
02	45.0	51.6	20- 83.2	28.2- 75	Accept.
B'S IN MICROGRAMS/LITER					
CB-AROCLOR 1232					
01	2.27	2.76	0.709- 4.3	1.17- 3.84	Accept.
B-AROCLOR 1248					
02	3.35	4.26	1.77- 6.04	2.3- 5.5	Accept.
B'S IN OIL IN MILLIGRAMS/KILOGRAM					
B IN OIL- 1016/1242					
01	2.23	42.3	6.80- 58.9	13.5- 52.3	Not Accept.
B IN OIL- 1260					
02	1.65	12.7	3.17- 20.4	5.37- 18.2	Not Accept.

Participant ID: IN00054 Type: OTHER Requesting Office: WI

Sample Number	Reported Value	True Value*	Acceptance Limits	Warning Limits	Performance Evaluation
PESTICIDES IN MICROGRAMS/LITER					
ALDRIN					
01	3.36	3.11	0.522- 5.23	1.12- 4.64	Accept.
02	0.184	0.243	0.065-0.322	0.0977-0.289	Accept.
DIELDRIN					
01	4.77	4.51	2.62- 6.22	3.08- 5.76	Accept.
02	1.37	1.62	0.858- 2.19	1.03- 2.02	Accept.
DDD					
01	6.48	5.67	3.14- 9.33	3.92- 8.55	Accept.
02	1.62	1.94	1.21- 2.54	1.39- 2.46	Accept.
DDE					
01	3.93	3.76	2.14- 5.1	2.51- 4.73	Accept.
02	1.16	1.42	0.72- 1.85	0.863- 1.71	Accept.
DDT					
01	7.00	6.46	3.79- 9.28	4.48- 8.59	Accept.
02	1.54	1.76	0.865- 2.33	1.05- 2.14	Accept.
HEPTACHLOR					
01	2.90	2.85	0.694- 4.14	1.13- 3.71	Accept.
02	0.267	0.279	0.0899-0.374	0.126-0.338	Accept.
CHLORDANE					
03	9.76	12.3	4.69- 17.2	6.27- 15.6	Accept.
04	1.20	1.36	0.695- 1.81	0.835- 1.67	Accept.
HEPTACHLOR EPOXIDE					
01	2.12	2.20	1.13- 2.53	1.31- 2.35	Accept.
02	0.265	0.284	0.153- 0.37	0.18-0.342	Accept.
VOLATILE HALOCARBONS IN MICROGRAMS/LITER					
1,2 DICHLOROETHANE					
01	58.7	56.3	39- 79.4	44.1- 74.4	Accept.
02	12.9	12.2	8.5- 17.5	9.53- 16.4	Accept.
CHLOROFORM					
01	70.5	64.8	47.6- 83.2	52.1- 78.7	Accept.
02	16.5	14.2	11- 18.4	11.9- 17.4	Accept.
1,1,1 TRICHLOROETHANE					
01	66.3	63.7	41- 85.7	46.6- 80.1	Accept.
02	17.4	16.2	10.4- 22.2	11.9- 20.7	Accept.
TRICHLOROETHENE					
01	78.7	72.3	45.7- 93	51.6- 87.1	Accept.
02	18.9	16.1	10.7- 20.6	11.9- 19.4	Accept.
CARBONTETRACHLORIDE					
01	33.5	29.0	16.5- 45	20- 41.4	Accept.
02	11.1	9.36	5.61- 13.7	6.62- 12.7	Accept.
TETRACHLOROETHENE					
01	73.7	73.6	46.5- 96.3	52.7- 90.1	Accept.
02	11.2	10.4	6.04- 14.5	7.1- 13.4	Accept.
BROMODICHLOROMETHANE					
01	58.9	55.6	37- 73.1	41.6- 68.6	Accept.
02	15.5	14.6	10.2- 18.4	11.2- 17.3	Accept.

Performance Evaluation Report
USEPA Water Pollution Study WP035

Date: 16APR96

icipant ID: IN00054   Type: OTHER   Requesting Office: WI

Sample Number	Reported Value	True Value*	Acceptance Limits	Warning Limits	Performance Evaluation
DIBROMOCHLOROMETHANE					
01	54.5	48.5	33.1- 63.4	37- 59.6	Accept.
02	16.8	14.6	9.59- 18.9	10.7- 17.7	Accept.
BROMOFORM					
01	48.8	68.0	50.4- 95.3	56- 89.7	Not Accept.
02	12.8	12.6	8.42- 17.3	9.53- 16.2	Accept.
METHYLENE CHLORIDE					
01	40.9	46.7	30.3- 64.1	34.6- 59.9	Accept.
02	14.9	10.3	6.63- 14.7	7.65- 13.7	Not Accept.
CHLOROBENZENE					
01	77.2	68.1	46.5- 89	51.9- 83.7	Accept.
02	20.4	17.7	11.7- 24.2	13.2- 22.6	Accept.
VOLATILE AROMATICS IN MICROGRAMS/LITER					
BENZENE					
01	54.4	55.9	40.7- 69.9	44.4- 66.2	Accept.
02	10.6	9.30	6.56- 12.3	7.29- 11.6	Accept.
ETHYLBENZENE					
01	48.3	56.4	38.7- 73.3	43- 69	Accept.
02	10.7	10.4	7.18- 13.6	7.99- 12.8	Accept.
TOLUENE					
01	41.8	44.7	30.9- 57.6	34.3- 54.2	Accept.
02	8.25	7.60	5.29- 9.97	5.88- 9.38	Accept.
1,2-DICHLOROBENZENE					
01	57.5	52.0	40.7- 66.5	44- 63.2	Accept.
02	15.5	11.7	7.82- 16.6	8.92- 15.5	Accept.
1,4-DICHLOROBENZENE					
01	47.4	48.3	33.3- 62.2	37- 58.5	Accept.
02	14.7	13.4	9.37- 17.6	10.4- 16.6	Accept.
1,3-DICHLOROBENZENE					
01	41.5	42.7	34.4- 53.1	36.7- 50.7	Accept.
02	14.1	12.6	8.9- 16.5	9.79- 15.6	Accept.
MISCELLANEOUS PARAMETERS					
TOTAL CYANIDE (IN MG/L)					
01	0.013	.0301	0.0138-0.046	0.0179-0.042	Not Accept.
02	0.201	0.410	0.297-0.522	0.325-0.493	Not Accept.
NON-FILTERABLE RESIDUE (IN MG/L)					
01	71.4	88.0	61.9- 98.1	66.4- 93.6	Accept.
02	38.4	56.0	42.7- 60.1	44.9- 57.9	Not Accept.
OIL AND GREASE (IN MG/L)					
01	65.6	46.0	29.5- 54.1	32.6- 51	Not Accept.
02	37.6	18.9	12- 23.2	13.4- 21.8	Not Accept.
TOTAL PHENOLICS (IN MG/L)					
01	2.82	2.71	1.47- 3.96	1.78- 3.64	Accept.
02	1.15	1.19	0.519- 1.87	0.692- 1.7	Accept.

Performance Evaluation Report
USEPA Water Pollution Study WP036

Report: PE005
Page: 1
Date: 07NOV96

icipant ID: IN00054   Type: OTHER   Requesting Office: R05

Sample Number	Reported Value	True Value*	Acceptance Limits	Warning Limits	Performance Evaluation
RACE METALS IN MICROGRAMS/LITER					
LUMINUM					
01	3600	3609	3130- 4040	3250- 3920	Accept.
RSENIC					
01	256	250	210- 292	220- 282	Accept.
ERYLLIUM					
01	51.1	51.1	39.9- 62.9	42.8- 60	Accept.
CADMIUM					
01	136	131	113- 148	117- 144	Accept.
OBALT					
01	461	433	386- 497	400- 483	Accept.
HROMIUM					
01	263	250	218- 289	227- 280	Accept.
COPPER					
01	571	552	515- 618	528- 605	Accept.
RON					
01	858	790	715- 934	742- 906	Accept.
MERCURY					
01	4.96	4.70	3.53- 5.91	3.83- 5.61	Accept.
MANGANESE					
01	784	750	686- 812	702- 797	Accept.
NICKEL					
01	1920	1812	1560- 2030	1710- 1990	Accept.
LEAD					
01	380	375	332- 429	344- 417	Accept.
SELENIUM					
01	121	310	244- 360	258- 345	Not Accept.
VANADIUM					
01	6950	6662	5980- 7620	6180- 7410	Accept.
ZINC					
01	1290	1203	1100- 1370	1140- 1340	Accept.
NTIMONY					
02	711	891	590- 1070	650- 1010	Accept.
SILVER					
02	576	573	448- 659	474- 633	Accept.
THALLIUM					
02	737	787	630- 908	665- 873	Accept.
OLYBDENUM					
02	491	473	403- 536	420- 519	Accept.
STRONTIUM					
02	246	243	206- 277	215- 268	Accept.
MINERALS IN MILLIGRAMS/LITER (EXCEPT AS NOTED)					
H-UNITS					
02	8.77	8.73	8.54- 9.01	8.6- 8.95	Accept.

Performance Evaluation Report
USEPA Water Pollution Study WP036

Report: PE005
Page: 2
Date: 07NOV95

icipant ID: IN00054 Type: OTHER Requesting Office: R05

Sample Number	Reported Value	True Value*	Acceptance Limits	Warning Limits	Performance Evaluation
PEC. COND. (UMHOS/CM AT 25 C)					
01	266	269	251- 293	256- 288	Accept.
DS AT 180 C					
01	159	148	104- 187	114- 177	Accept.
OTAL HARDNESS(AS CACO3)					
01	50.4	47.4	42.5- 53.7	43.9- 52.3	Accept.
LCIUM					
01	18.0	17.0	14.8- 19.5	15.4- 18.9	Accept.
MAGNESIUM					
01	1.33	1.20	0.983- 1.42	1.04- 1.37	Accept.
ODIUM					
01	7.72	7.46	6.55- 9.17	6.83- 8.85	Accept.
TASSIUM					
01	33.8	33.1	30.5- 37.5	31.4- 36.6	Accept.
TOTAL ALKALINITY(AS CACO3)					
01	14.5	13.0	9.69- 16.8	10.6- 15.9	Accept.
LORIDE					
01	40.0	34.8	30.8- 38.4	31.8- 37.4	Not Accept.
LUORIDE					
01	0.183	0.210	0.153- 0.27	0.168-0.255	Accept.
SULFATE					
01	46.7	44.0	36.4- 49.1	37.9- 47.5	Accept.
TRIENTS IN MILLIGRAMS/LITER					
MMONIA-NITROGEN					
01	10.0	10.0	8.05- 12	8.52- 11.5	Accept.
TRATE-NITROGEN					
01	2.03	2.10	1.73- 2.48	1.82- 2.39	Accept.
THOPHOSPHATE					
01	0.898	0.880	0.768- 1.02	0.798-0.988	Accept.
KJELDAHL-NITROGEN					
02	8.43	8.90	6.62- 10.9	7.13- 10.4	Accept.
TAL PHOSPHORUS					
02	2.67	2.90	2.46- 3.43	2.58- 3.31	Accept.
MANDS IN MILLIGRAMS/LITER					
OD					
01	18.6	20.8	10.7- 32.2	13.5- 29.5	Accept.
DAY BOD					
01	12.6	13.0	6.59- 19.2	8.44- 17.7	Accept.
RBONACEOUS BOD					
01	12.4	11.3	5.33- 17.3	6.93- 15.7	Accept.
CB'S IN MICROGRAMS/LITER					
B-AROCLOR 1016/1242					
02	1.99	3.65	1.48- 4.82	1.9- 4.4	Accept.

Performance Evaluation Report
USEPA Water Pollution Study WP036

-icipant ID: IN00054 Type: OTHER Requesting Office: R05

Sample Number	Reported Value	True Value*	Acceptance Limits	Warning Limits	Performance Evaluation
PCB-AROCLOR 1254					
01	1.45	1.78	0.627- 2.59	0.875- 2.35	Accept.
PCB'S IN OIL IN MILLIGRAMS/KILOGRAM					
-PCB IN OIL- 1016/1242					
02	14.3	17.9	1.13- 28.8	4.68- 25.3	Accept.
PCB IN OIL- 1254					
01	14.5	15.9	0.227- 28.6	3.9- 24.9	Accept.
PESTICIDES IN MICROGRAMS/LITER					
-ALDRIN					
01	0.244	0.313	0.0856-0.425	0.129-0.382	Accept.
DIELDRIN					
01	1.01	1.24	0.675- 1.68	0.803- 1.55	Accept.
-DDD					
01	1.87	2.35	1.27- 3.29	1.52- 3.03	Accept.
DDE					
01	0.942	1.18	0.605- 1.55	0.725- 1.43	Accept.
DDT					
01	1.67	2.05	1.07- 2.68	1.27- 2.48	Accept.
-HEPTACHLOR					
01	0.288	0.386	0.119-0.525	0.171-0.473	Accept.
CHLORDANE					
03	1.98	2.34	1.14- 3.33	1.42- 3.06	Accept.
HEPTACHLOR EPOXIDE					
01	0.160	0.222	0.118-0.285	0.139-0.264	Accept.
VOLATILE HALOCARBONS IN MICROGRAMS/LITER					
1,2 DICHLOROETHANE					
01	12.7	10.5	8.14- 15.8	9.1- 14.9	Accept.
-CHLOROFORM					
01	12.7	11.1	8.85- 14.6	9.57- 13.9	Accept.
-1,1,1 TRICHLOROETHANE					
01	13.0	11.7	8.67- 15.8	9.56- 14.9	Accept.
TRICHLOROETHENE					
01	15.7	14.7	10- 19.5	11.2- 18.3	Accept.
-CARBONTETRACHLORIDE					
01	15.9	13.3	8.7- 20.4	10.2- 18.9	Accept.
TETRACHLOROETHENE					
01	14.4	14.5	9.56- 19.2	10.8- 18	Accept.
BROMODICHLOROMETHANE					
01	13.1	12.0	8.48- 15.6	9.37- 14.7	Accept.
-DIBROMOCHLOROMETHANE					
01	13.6	11.7	9.22- 15.9	10- 15	Accept.
BROMOFORM					
01	14.2	16.3	11.9- 22.8	13.3- 21.5	Accept.

Performance Evaluation Report
USEPA Water Pollution Study WP036

cipant ID: IN00054 Type: OTHER Requesting Office: R05

Sample Number	Reported Value	True Value*	Acceptance Limits	Warning Limits	Performance Evaluation
ETHYLENE CHLORIDE					
01	15.9	16.4	12.6- 24.4	14.1- 22.9	Accept.
HLOROBENZENE					
01	14.5	13.6	10.9- 17.6	11.8- 16.8	Accept.
OLATILE AROMATICS IN MICROGRAMS/LITER					
ENZENE					
01	21.1	18.6	14.1- 24.3	15.4- 23	Accept.
THYLBENZENE					
01	19.3	19.8	13.8- 25.4	15.3- 23.9	Accept.
OLUENE					
01	17.8	17.0	12.4- 22	13.6- 20.8	Accept.
,2-DICHLOROBENZENE					
01	7.98	9.19	6.42- 12.4	7.17- 11.7	Accept.
4-DICHLOROBENZENE					
01	5.94	7.60	5.23- 10.2	5.87- 9.6	Accept.
3-DICHLOROBENZENE					
01	7.23	8.40	5.73- 10.9	6.38- 10.3	Accept.
ISCELLANEOUS PARAMETERS					
TAL CYANIDE(IN MG/L)					
01	0.930	0.921	0.645- 1.18	0.712- 1.11	Accept.
N-FILTERABLE RESIDUE(IN MG/L)					
01	21.7	30.0	20.1- 31.4	21.5- 30	Accept.
IL AND GREASE(IN MG/L)					
01	17.7	19.5	11.9- 23.9	13.4- 22.4	Accept.
TAL PHENOLICS(IN MG/L)					
01	0.517	0.483	0.27-0.697	0.325-0.642	Accept.
OTAL RESIDUAL CHLORINE(IN MG/L)					
01	0.697	0.690	0.543-0.834	0.581-0.796	Accept.

***** END OF DATA FOR IN00054 **********
FOR LIMITS AND TRUE VALUES, ASSUME THREE SIGNIFICANT DIGITS.
**** END OF REPORT FOR IN00054 **********

d on gravimetric calculations, or a reference value when necessary.

Performance Evaluation Report
USEPA Water Supply Study WS036

Participant ID: IN00054 Type: OTHER Requesting Office: BCS

Analyte	Sample Number	Reported Value	True Value*	Acceptance Limits	Performance Evaluation
TRACE METALS IN MICROGRAMS PER LITER:					
001-ARSENIC	001	125	120	107- 136	Accept.
002-BARIUM	002	1290	1300	1110- 1500	Accept.
003-CADMIUM	001	32.0	34.0	27.2- 40.8	Accept.
004-CHROMIUM	001	31.9	37.8	32.1- 43.5	--- Not Accept.
005-LEAD	001	34.9	39.0	27.3- 50.7	Accept.
006-MERCURY	001	2.82	3.00	2.1- 3.9	Accept.
007-SELENIUM	001	27.8	31.1	24.9- 37.3	Accept.
008-SILVER	002	55.5	54.2	47.2- 60.2	Accept.
091-COPPER	001	631	630	567- 693	Accept.
140-ANTIMONY	002	<50.0	11.0	7.7- 14.3	Unusable
141-BERYLLIUM	001	6.90	7.70	6.55- 8.86	Accept.
142-NICKEL	001	384	380	323- 437	Accept.
143-THALLIUM	002	4.73	4.50	3.15- 5.85	Accept.
226-BORON	002	488	480	444- 502	Accept.
235-ALUMINUM	001	45.1	51.0	43.2- 67.3	Accept.
236-MANGANESE	001	993	970	911- 1030	Accept.
237-MOLYBDENUM	002	<10.0	11.0	8.29- 13.9	Unusable
239-ZINC	001	1430	1410	1280- 1530	Accept.
NITRATE/NITRITE/FLUORIDE IN MILLIGRAMS PER LITER:					
009-NITRATE AS N	001	4.29	2.90	2.61- 3.19	Not Accept.
010-FLUORIDE	001	7.59	7.20	6.48- 7.92	Accept.
092-NITRITE AS N	001	1.11	1.10	0.935- 1.27	Accept.

Participant ID: IN00054 Type: OTHER Requesting Office: RCS

	Sample Number	Reported Value	True Value*	Acceptance Limits	Performance Evaluation
INSECTICIDES IN MICROGRAMS PER LITER:					
11-ENDRIN	001	0.366	0.383	0.268-0.498	Accept.
012-LINDANE	001	0.311	0.429	0.236-0.622	Accept.
013-METHOXYCHLOR	001	24.3	28.9	15.9- 41.9	Accept.
14-TOXAPHENE	002	10.1	14.7	8.09- 21.3	Accept.
097-CHLORDANE (TOTAL)	003	11.1	16.7	9.19- 24.2	Accept.
ADIPATE/PHTHALATES IN MICROGRAMS PER LITER:					
34-BIS(2-ETHYLHEXYL)ADIPATE	001	19.9	16.9	3.26- 25.8	Accept.
135-BUTYLBENZYL PHTHALATE	001	16.5	15.9	1.67- 24.6	Accept.
36-BIS(2-ETHYLHEXYL)PHTHAL.	001	21.3	18.3	4.43- 30.5	Accept.
50-DIETHYL PHTHALATE	001	14.5	23.8	7.98- 37.9	Accept.
151-DIMETHYL PHTHALATE	001	<5.00	27.4	5.33- 38.5	Not Accept.
TRIHALOMETHANES IN MICROGRAMS PER LITER:					
017-CHLOROFORM	001	23.4	21.7	17.4- 26	Accept.
018-BROMOFORM	001	36.7	38.6	30.9- 46.3	Accept.
19-BROMODICHLOROMETHANE	001	25.4	26.8	21.4- 32.2	Accept.
020-CHLORODIBROMOMETHANE	001	34.2	34.2	27.4- 41	Accept.
021-TOTAL TRIHALOMETHANE	001	120	121.3	97- 146	Accept.
VOLATILE ORGANIC COMPOUNDS IN MICROGRAMS PER LITER:					
032-VINYL CHLORIDE	001	8.39	9.47	5.68- 13.3	Accept.
34-1,1-DICHLOROETHYLENE	001	7.38	8.49	5.09- 11.9	Accept.
35-1,2-DICHLOROETHANE	001	9.10	9.00	5.4- 12.6	Accept.
036-1,1,1-TRICHLOROETHANE	001	13.0	14.5	11.6- 17.4	Accept.
37-CARBON TETRACHLORIDE	001	10.5	12.6	10.1- 15.1	Accept.

Participant ID: IN00054 Type: OTHER Requesting Office: R05

	Sample Number	Reported Value	True Value*	Acceptance Limits	Performance Evaluation
038-TRICHLOROETHYLENE					
	001	14.4	17.4	13.9- 20.9	Accept.
039-BENZENE					
	001	7.11	7.49	4.49- 10.5	Accept.
040-TETRACHLOROETHYLENE					
	002	14.8	18.5	14.8- 22.2	Accept.
041-1,4-DICHLOROBENZENE					
	001	10.4	11.9	9.52- 14.3	Accept.
042-T 1,2 DICHLOROETHYLENE					
	002	11.1	11.6	9.28- 13.9	Accept.
044-1,2 DICHLOROPROPANE					
	002	15.0	16.4	13.1- 19.7	Accept.
047-TOLUENE					
	002	12.9	13.2	10.6- 15.8	Accept.
048-ETHYLBENZENE					
	002	13.4	14.8	11.8- 17.8	Accept.
049-CHLOROBENZENE					
	002	15.6	16.3	13- 19.6	Accept.
053-STYRENE					
	002	12.6	12.9	10.3- 15.5	Accept.
055-DICHLOROMETHANE					
	001	11.6	12.3	9.84- 14.8	Accept.
061-1,1,2-TRICHLOROETHANE					
	001	6.43	6.46	3.88- 9.04	Accept.
076-1,2,4-TRICHLOROBENZENE					
	002	14.9	12.6	10.1- 15.1	Accept.
090-TOTAL XYLENES					
	002	11.3	10.4	8.32- 12.5	Accept.
MISCELLANEOUS ANALYTES:					
122-RESIDUAL FREE CHLORINE (MILLIGRAMS PER LITER)					
	001	0.510	0.562	0.408-0.715	Accept.
124-TOTAL FILTERABLE RESIDUE (MILLIGRAMS PER LITER)					
	001	462	380	269- 626	Accept.
125-CALCIUM (MG. CACO3/L)					
	001	245	215	202- 235	Not Accept.
126-PH-UNITS					
	001	8.84	9.13	8.85- 9.32	Not Accept.
127-ALKALINITY (MG. CACO3/L)					
	001	40.0	38.1	36.6- 44.9	Accept.
129-SODIUM (MILLIGRAMS PER LITER)					
	001	16.3	17.5	16.5- 20.1	Not Accept.
135-SULFATE (MILLIGRAMS PER LITER)					
	001	74.7	81.0	71.9- 87.6	Accept.
146-TOTAL CYANIDE (MILLIGRAMS PER LITER)					
	001	0.178	0.200	0.15- 0.25	Accept.

Performance Evaluation Report
USEPA Water Supply Study WS037

Report: PE005
Page: 1
Date: 06SEP96

Participant ID: IN00054   Type: OTHER   Requesting Office: IN

	Sample Number	Reported Value	True Value*	Acceptance Limits	Performance Evaluation
TRACE METALS IN MICROGRAMS PER LITER:					
001-ARSENIC	001	48.5	49.3	41.9- 56.3	Accept.
02-BARIUM	002	784.	773	657- 889	Accept.
03-CADMIUM	001	10.4	10.2	8.16- 12.2	Accept.
004-CHROMIUM	001	73.2	72.9	62- 83.8	Accept.
05-LEAD	001	13.3	13.8	9.66- 17.9	Accept.
006-MERCURY	001	7.76	8.16	5.71- 10.6	Accept.
007-SELENIUM	001	62.7	57.9	46.3- 69.5	Accept.
1-COPPER	001	55.5	55.7	50.1- 61.3	Accept.
140-ANTIMONY	002	19.2	18.0	12.6- 23.4	Accept.
41-BERYLLIUM	001	4.20	4.26	3.62- 4.9	Accept.
42-NICKEL	001	54.3	55.0	46.8- 63.3	Accept.
143-THALLIUM	002	2.67	2.38	1.67- 3.09	Accept.
26-BORON	002	1000.	929	876- 1030	Accept.
36-MANGANESE	001	49.5	48.1	43- 51.4	Accept.
237-MOLYBDENUM	002	53.8	54.0	42.6- 65.4	Accept.
39-ZINC	001	619.	600	536- 652	Accept.
NITRATE/NITRITE/FLUORIDE IN MILLIGRAMS PER LITER:					
09-NITRATE AS N	001	9.20	8.30	7.47- 9.13	Not Accept.
12-NITRITE AS N	001	0.544	0.502	0.427-0.577	Accept.
261-ORTHOPHOSPHATE AS P	001	1.17	1.10	0.957- 1.21	Accept.
INSECTICIDES IN MICROGRAMS PER LITER:					
1-ENDRIN	001	0.218	0.231	0.162- 0.3	Accept.

Performance Evaluation Report
USEPA Water Supply Study WS037

articipant ID: IN00054 Type: OTHER Requesting Office: IN

	Sample Number	Reported Value	True Value#	Acceptance Limits	Performance Evaluation
12-LINDANE					
	001	0.334	0.381	0.21-0.552	Accept.
13-METHOXYCHLOR					
	001	12.6	18.5	10.2- 26.8	Accept.
4-TOXAPHENE					
	002	8.23	8.81	4.85- 12.8	Accept.
97-CHLORDANE (TOTAL)					
	003	3.80	4.44	2.44- 6.44	Accept.
TRIHALOMETHANES IN MICROGRAMS PER LITER:					
17-CHLOROFORM					
	001	22.2	22.3	17.8- 26.8	Accept.
18-BROMOFORM					
	001	19.9	18.6	14.9- 22.3	Accept.
19-BROMODICHLOROMETHANE					
	001	13.5	12.7	10.2- 15.2	Accept.
20-CHLORODIBROMOMETHANE					
	001	15.2	14.2	11.4- 17	Accept.
021-TOTAL TRIHALOMETHANE					
	001	70.8	67.8	54.2- 81.4	Accept.
VOLATILE ORGANIC COMPOUNDS IN MICROGRAMS PER LITER:					
32-VINYL CHLORIDE					
	001	13.9	14.8	8.88- 20.7	Accept.
034-1,1-DICHLOROETHYLENE					
	001	15.4	16.5	13.2- 19.8	Accept.
5-1,2-DICHLOROETHANE					
	001	15.8	13.2	10.6- 15.8	Accept.
36-1,1,1-TRICHLOROETHANE					
	001	10.4	10.3	8.24- 12.4	Accept.
037-CARBON TETRACHLORIDE					
	001	11.9	12.7	10.2- 15.2	Accept.
8-TRICHLOROETHYLENE					
	001	8.31	8.70	5.22- 12.2	Accept.
39-BENZENE					
	001	12.1	12.5	10- 15	Accept.
40-TETRACHLOROETHYLENE					
	002	9.33	9.60	5.76- 13.4	Accept.
1-1,4-DICHLOROBENZENE					
	001	7.55	7.31	4.39- 10.2	Accept.
042-T 1,2 DICHLOROETHYLENE					
	002	13.7	14.8	11.8- 17.8	Accept.
3-C 1,2 DICHLOROETHYLENE					
	002	9.61	9.72	5.83- 13.6	Accept.
4-1,2 DICHLOROPROPANE					
	002	13.0	14.2	11.4- 17	Accept.

Performance Evaluation Report
USEPA Water Supply Study WS037

Report: PE005
Page: 3
Date: 06SEP96

Participant ID: IN00054 Type: OTHER Requesting Office: IN

	Sample Number	Reported Value	True Value*	Acceptance Limits	Performance Evaluation
047-TOLUENE					
	002	6.44	5.70	3.42- 7.98	Accept.
048-ETHYLBENZENE					
	002	9.30	9.19	5.51- 12.9	Accept.
049-CHLOROBENZENE					
	002	8.69	8.31	4.99- 11.6	Accept.
053-STYRENE					
	002	7.55	7.40	4.44- 10.4	Accept.
054-1,2 DICHLOROBENZENE					
	002	14.4	14.5	11.6- 17.4	Accept.
055-DICHLOROMETHANE					
	001	11.3	8.41	5.05- 11.8	Accept.
061-1,1,2-TRICHLOROETHANE					
	001	11.8	10.7	8.56- 12.8	Accept.
090-TOTAL XYLENES					
	002	13.9	12.9	10.3- 15.5	Accept.
MISCELLANEOUS ANALYTES:					
022-RESIDUAL FREE CHLORINE(MILLIGRAMS PER LITER)					
	001	2.71	2.20	2.03- 3.07	Accept.
024-TOTAL FILTERABLE RESIDUE(MILLIGRAMS PER LITER)					
	001	388.	264	188- 434	Accept.
025-CALCIUM HARDNESS(MG. CACO3/L)					
	001	173.	144	137- 158	Not Accept.
026-PH-UNITS					
	001	9.07	9.13	8.88- 9.31	Accept.
027-ALKALINITY(MG. CACO3/L)					
	001	31.2	27.4	25.7- 31.5	Accept.
029-SODIUM(MILLIGRAMS PER LITER)					
	001	13.4	12.6	11.4- 13.7	Accept.
145-SULFATE(MILLIGRAMS PER LITER)					
	001	278.	280	253- 316	Accept.
146-TOTAL CYANIDE(MILLIGRAMS PER LITER)					
	001	0.401	0.380	0.285-0.475	Accept.

********** END OF DATA FOR IN00054 **********
NOTE: FOR LIMITS AND TRUE VALUES, ASSUME THREE SIGNIFICANT DIGITS.
********** END OF REPORT FOR IN00054 **********

* Based on gravimetric calculations, or a reference value when necessary.

Appendix B

Appendix C

The State of Wisconsin

DEPARTMENT OF NATURAL RESOURCES

WISCONSIN
DEPT OF NATURAL RESOURCES

Hereby grants

Certification

under the provisions of ch. NR 149, Wisconsin Administrative Code to:

American Analytical Inc (A2I)
250 West 84th Dr
Merrillville, IN 46410

998036710

Laboratory ID Number

Issued: August 15, 1996

Expires: June 30, 1997

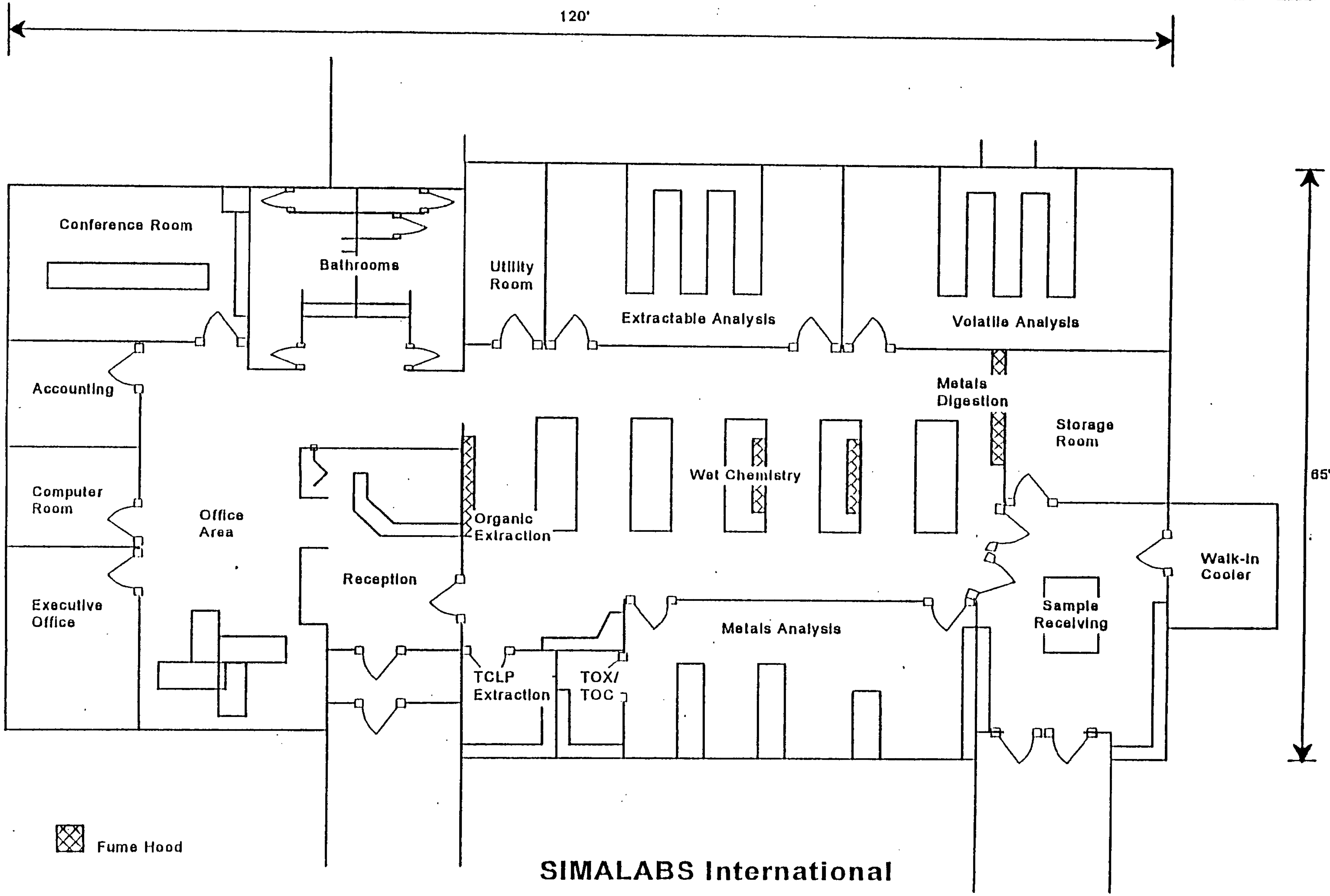
for the following test categories:

* Nitrogen
  Ammonia
  Nitrite
  Kjeldahl Nitrogen
* Phosphorus
  Orthophosphate
  T. Phosphorus
* Physical
  Oil and Grease
  T. Dissolved Solids
  T. Solids
  T. Suspended Solids
* General II
  Chloride
  Cyanide
  COD
  Phenolics
* Metals I
  Silver
  Aluminum
  Arsenic
  Barium
  Calcium
  Cadmium
  Chromium
  Copper
  Iron
  Hexavalent Chromium
  Mercury
  Potassium
  Magnesium
  Manganese
  Nickel
  Lead
  Antimony
  Selenium
  Thallium
  Zinc
* Organics; Purgeable
  Volatile Organics (VOCs)
* Organics; Organochlorine
  PCBs
  Organochlorine Pesticides

Chief, Analytical and Statistical Services

George E. Meyer
Secretary

Certification or registration by the State of Wisconsin is not an endorsement or guarantee of the validity of data generated by this laboratory. This certificate is valid unless revoked or suspended and supersedes all previous certificates. Rev. 3-96



SIMALABS International

Building/Lab Diagram

250 W. 84th Drive
Merrillville, IN 46410
revised 1/22/97

Appendix C

Chain of Custody Record

200 South Michigan Ave.
Chicago, Illinois 60604
(312)922-1030
Fax (312)922-0201

SIMA·LABS
INTERNATIONAL
250 West 84th Drive
Merrillville, IN 46410
219-769-8378

CHAIN OF CUSTODY

Number 16172

Page ______ of ______

Client	Project Name:	Project No.
Address	Location:	
	Turnaround Time (circle one):	
Telephone No.	24 Hour 48Hour 72 Hour 3-5 Days 7-10 Days	

Contact person to telephone / fax (circle one) results to: ______________________ Fax No. ______________________

Purchase Order No. (or other billing reference): ______________________

Sampled by (PRINT): | Sampler Signature:

Sample #	Date	Time	Sample Description	# of Containers	Matrix	ANALYSIS REQUESTED: Filtered (Y/N)	Preserved												Laboratory Identification

COMMENTS:	Relinquished by:	Date/Time	Received by:	Date/Time

Field Sampling Form

200 South Michigan Ave.
Chicago, Illinois 60604
(312)922-1030
Fax (312)922-0201

WEAVER BOOS CONSULTANTS, INC.

200 South Michigan Ave., Suite 900
Chicago, IL 60604

Groundwater Sampling Field Form

Date:____________________

Site: **Feddeler Construction/Demolition Site** Location: Lowell, Indiana Permit No.:45-08
File: 97094.00

Name of Person(s) Sampling: ______________________________ Title: ____________________

Monitoring Well No.: ____________ Upgradient: ________ Downgradient: ________

Top of Procover: _________MSL Top of PVC: _________MSL Ground Surface: ________MSL

Ground Water Depth (from top of PVC):_____ ft. _____MSL Measured Well Depth (fr. top pvc)
_____ft._____MSL

Installed Well Depth _____ft._____MSL

Water Volume in Casing: _______ gal. Time Purge Started: _____ Differential _____ft._____MSL
2" well contains 0.163 gallons/foot Time Purge Ended _____ Corrective Action Required Yes___ No ___
4" well contains 0.652 gallons/foot (Differential +/- 2 feet)

Well Diameter:
. Total Volume Purged: _______ gal. (Min. 3 to 5 vols.) Well Pumped/Bailed Dry? Yes No

Bailer/Pump: ____________________ Dedicated? Yes No Disposable? Yes No

Field Meters (pH, Eh, SC): ____________________ Dedicated? Yes No Disposable? Yes No

Field Equipment: ____________________ Dedicated? Yes No Disposable? Yes No

Method of Decontamination: ____

Sample Condition: Color: ____________________________ Odor:
____

Field Measurements:	#1	#2	#3	mean	#4	new mean	#5	#6	
pH	___	___	___	___	___	___	___	___	std. units
Specific Conductivity	___	___	___	___	___	___	___	___	umhos/cm
Temperature	___	___	___	___	___	___	___	___	°C
Time	___	___	___	___	___	___	___	___	

Well Recharge: Very Poor Poor Fair Moderate Good Very Good

Weather Conditions: Temperature: __________ Skies: Clear Partly Cloudy Cloudy
Precipitation: __________ Light Moderate Heavy
Wind Speed/Direction: ______ N NE E SE S SW W NW

Notes/Observations:____
____
____

Sampler(s) Signature: ______________________________ ______________________________

P 125 733 542

SB:Hms N1154

US Postal Service

Receipt for Certified Mail

65-45-1
Robert Feddeler
Feddeler C/D Landfill
18501 Clark Road
Lowell, IN 46356

INDIANAPOLIS IN BMEU USPS JAN 14 1998

Postage	$ 55
Certified Fee	135
Special Delivery Fee	
Restricted Delivery Fee	110
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, & Addressee's Address	
TOTAL Postage & Fees	$ 300
Postmark or Date	IDEM N1154

PS Form **3800**, April 1995

Stick postage stamps to article to cover First-Class postage, certified mail fee, and charges for any selected optional services *(See front).*

1. If you want this receipt postmarked, stick the gummed stub to the right of the return address leaving the receipt attached, and present the article at a post office service window or hand it to your rural carrier *(no extra charge).*

2. If you do not want this receipt postmarked, stick the gummed stub to the right of the return address of the article, date, detach, and retain the receipt, and mail the article.

3. If you want a return receipt, write the certified mail number and your name and address on a return receipt card, Form 3811, and attach it to the front of the article by means of the gummed ends if space permits. Otherwise, affix to back of article. Endorse front of article **RETURN RECEIPT REQUESTED** adjacent to the number.

4. If you want delivery restricted to the addressee, or to an authorized agent of the addressee, endorse **RESTRICTED DELIVERY** on the front of the article.

5. Enter fees for the services requested in the appropriate spaces on the front of this receipt. If return receipt is requested, check the applicable blocks in item 1 of Form 3811.

6. Save this receipt and present it if you make an inquiry.

SBIHMS Helen N1154 Marlette

SENDER:
- Complete items 1 and/or 2 for additional services.
- Complete items 3, 4a, and 4b.
- Print your name and address on the reverse of this form so that we can return this ... to you.
- ...h this form to the front of the mailpiece, or on the back if space does not permit.
- Write *"Return Receipt Requested"* on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):

1. ☐ Addressee's Address
2. ☐ Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:

65-45-1
Robert Feddeler
Feddeler C/D Landfill
18501 Clark Road
Lowell, IN 46356

4a. Article Number
P 125 733 542

4b. Service Type
☐ Registered ☐ Certified
☐ Express Mail ☐ Insured
☐ Return Receipt for Merchandise ☐ COD

7. Date of Delivery
1-21-98

5. Received By: *(Print Name)*

6. Signature: *(Addressee or Agent)*
X Julia A Brown

8. Addressee's Address *(Only if requested and fee is paid)*

Is your RETURN ADDRESS completed on the reverse side?

Thank you for using Return Receipt Service.

PS Form **3811**, December 1994

Domestic Return Receipt

UNITED STATES POSTAL SERVICE

IN. 01/21/98 19:16 HRS

First-Class Mail
Postage & Fees Paid
USPS
Permit No. G-[redacted]

• Print your name, address, and ZIP Code in this box •

DEPARTMENT OF
ENVIRONMENTAL MANAGEMENT
SOLID & HAZARDOUS WASTE MANAGEMENT
100 N. Senate
P.O. Box 6015
INDIANAPOLIS, IN 46206 - 6015

LOWELL, IN
JAN 21 1998
USPS

46206/6015

2c 1b

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

We make Indiana a cleaner, healthier place to live

Frank O'Bannon
Governor

John M. Hamilton
Commissioner

100 North Senate Avenue
P.O. Box 6015
Indianapolis, Indiana 46206-6015
Telephone 317-232-8603
Environmental Helpline 1-800-451-6027

January 12, 1998

VIA CERTIFIED MAIL P 125 733 542
Robert Feddeler
Feddeler C/D Landfill
18501 Clark Road
Lowell, IN 46356

Dear Robert Feddeler:

Re: Supplemental Information Request Ground Water Monitoring Program Sampling and Analysis Plan and/or Quality Assurance Project Plan
Feddeler C/D Landfill, Lake County

The Indiana Department of Environmental Management (IDEM) Solid Waste Chemistry Section has completed review of the Sampling and Analysis Plan (SAP) and/or Quality Assurance Project Plan (QAPjP), received on November 51997, for the Feddeler C/D Landfill located in Lake county.

Based on the review of the plans and information submitted to this Office and all available information contained in our files, additional information and/or modifications are required before further review may commence. The information and/or modifications requested are identified in the enclosure provided.

In order to provide a reasonable progression towards compliance with 329 IAC 10-21-2 and/or 329 IAC 10-21-2(b)(13), a response which includes the required information must be submitted no later than sixty (60) days from the date of receipt of this letter. Please submit two (2) copies of the revised SAP and/or QAPjP incorporating the additions, deletions, and/or modifications requested to:

Mr. Steven L. Buckel, Chief
Solid Waste Chemistry Section
Office of Solid and Hazardous Waste Management
Indiana Department of Environmental Management
100 North Senate Avenue - Room N1154
P. O. Box 6015
Indianapolis, Indiana 46206-6015

If you have any technical questions regarding the attached enclosure, please contact Devassy Koottungal , at (317)232-8868. All administrative questions should be directed to Jeff Sewell, at (317)233-5562.

Sincerely,

Mr. Steven L. Buckel, Chief
Solid Waste Chemistry Section
Office of Solid and Hazardous Waste Management

SB:hms
cc: Weaver Boos, Consultants, Inc.

CHEMISTRY ENCLOSURE

Feddeler Construction/Demolition Landfill, Lake County, Indiana
Sampling, Analysis, and Quality Assurance Program Plan

Contact : Devassy Koottungal
Solid Waste Chemistry Section
Telephone #: 317/232-8868

The Sampling and Analysis Plan (SAP) and Quality Assurance Program Plan (QAPP) dated November 3, 1997 have been reviewed according to guidelines established in 329 IAC 10 and "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," (SW-846) Third Edition, Final Updates 1, 2, 2A, and 2B. The SAP was prepared by Weaver Boos Consultants, Inc. and the QAPP by Sima . Labs International. The following additional information is required for approval of the SAP and QAPP:

1. Provide the correct procedure for purging with a bailer as described in 329 IAC 10-21-2(b)(5)(B), since the purging and sampling will be done with dedicated bailers. The purging procedure described in Section 21.2 of the SAP is for purging with a pump.

2. Change ammonium to ammonia in the parameter list provided on page 2 of the SAP. The Facility Permit # 45-08, Condition D10 lists ammonium. This may be a typographical error. Phase I monitoring program, 329 IAC 10-29-6(b), lists this parameter correctly.

3. Change Ammonium to Ammonia in the parameter list on Table 2 and expand Table 2 to include total phenolics.

4. Provide holding times, including extraction and analysis holding times where applicable. These are not provided in the SAP or QAPP.

5. Provide analytical parameter lists for the quality control blanks described in Sections 25.0 and 26.0.

6. The initial and continuing calibration verification (ICV and CCV) recovery limits provided in Section 6.2.3 of the QAPP for graphite furnace atomic absorption analysis (GFFA) are 80 - 120 %. These shall be changed to 90 - 110 %. These changes are recommended, just in case, GFFA methods will be used instead of ICP methods.

7. Include tuning criteria for bromofluorobenzene (BFB) in the QAPP.